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# TORREY BOTANICAL CLUB.

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## Emily L. Gregory.

By ELIZABETH G. BRITTON.

Botany and Barnard College have lost an earnest and devoted worker by the death of Doctor Gregory. Her loss is particularly sad just now when Barnard is at the threshold of its new and enlarged career, its scope and accommodations widened and its new home nearly ready for occupancy. That Dr. Gregory was one of the principal attractions of the College in the early days of its career, cannot be denied, for at first, the number of special students in botany exactly equalled, for three successive years, the total number of students in the College. She gave herself enthusiastically to her work and spared neither her time nor her strength in her devotion to her pupils, encouraging them to do original investigation and showing them by her own work and guidance in the laboratory how to do it. Her own attainments were high and diverse and she sometimes, perhaps, failed to realize that she befitted more advanced and special work than her students were qualified to accomplish, but whatever achievements are recorded from those who have worked with her, have always been of true scientific merit and often worthy of publication. Several have been read before the Torrey Botanical Club and published in the BULLETIN and elsewhere. Besides this Dr. Gregory did her share of "popularizing" botany by assisting with her pupils at the three "Annual Exhibits of the Progress of Science," held by the Academy of Sciences of New York in the spring of 1895–96 and 1897. and by various private evening classes of men and women. The high and special character of her training guided her studies en-

tirely into the lines of Morphology and Physiology, and for Systematic Botany she had very little interest, other than what was necessary for the accomplishment of her work in her own chosen fields. Neither can it be claimed that she accomplished a great deal of original investigation on widely different lines, but her frequent reviews in the BULLETIN show that she kept informed on the most advanced German investigations and theories and her little text-book on the "Elements of Plant Anatomy" demonstrates that she had thoroughly mastered a wide range of subjects and adapted them for the use of her pupils. She was not clear nor concise in her lectures and quizzes, but this came from her desire to impart all that she could of the wealth of information she had in store and is amply compensated for by the lasting influences which she has left among those who have had the advantage of studying with her.

Personally Dr. Gregory was extremely attractive, not only for her cheery good temper, but for her faculty in making friends and for her kindly and personal interest in all with whom she came in contact. She was simple and domestic in her tastes, preferring quiet and social pleasures to any show or ostentation, enjoying her "work for the work's sake," loving the truth and living an unselfish life which ended without any long or gradual failure of her powers, or any serious suffering or painful iliness. She died peacefully, believing in the faith of her parents, with full confidence that everything had been done for her comfort by the friends and relations about her and was accompanied to her grave at Angola, N. Y., by loving friends and beautiful flowers. Her memory remains among us, full of gayety and kindliness and sweet content.

## BIOGRAPHY.

Emily Loriva Gregory was born at Portage, New York, on December 31st, 1841. She received her early education at Albion Seminary and after graduating from there she taught at Dunkirk (Fredonia) Friendship Seminary and earned enough to go to Cornell University in 1876, where she studied botany and literature, taking her degree as Bachelor of Literature in 1881. She held a position at Smith College from 1881–1883 as teacher of botany,

and the following winter had charge of the laboratory work in botany of the Harvard Annex. In 1883–1884 she went abroad and studied for two years at Strasburg under Prof. Wigand and one year at Zürich, where on July 23d, 1886, she received her degree of Doctor of Philosophy, having been one of the earliest of American women to whom this honor was accorded. On her return to America she held a position at Bryn Mawr for two years as associate in botany to Prof. E. B. Wilson, who was then professor of biology at that institution. She resigned this position because it was not congenial to her, and during the following winter was associated with Prof. W. P. Wilson at the University of Pennsylvania in developing its botanical laboratory.

In the spring of 1889 she was appointed instructor in botany at Barnard College, and spent the summer abroad studying with Prof. Schwendener, at Berlin, and purchasing microscopes, charts, models and books for the new laboratory, the funds for the equipment of which were supplied from private subscriptions by members of the Torrey Botanical Club. She also spent her summer vacations abroad in 1893, 1894, and 1896, and always came back with renewed energy and zeal, as well as stores of books and fresh knowledge.

Her department grew rapidly in popularity and in numbers, and it soon became necessary to secure the assistance of Miss Effie Southworth, now Mrs. Volney M. Spalding, and later of Miss Jean Howell. The collections for the laboratory were first begun with the herbarium of Elizabeth G. Knight as a nucleus, and subsequently that of Dr. Thomas Morong was added by purchase, also with a fund raised by private subscription among the members of the Torrey Botanical Club. A fellowship in botany was also endowed by Mrs. Esther Herrman, one of our members.

The laboratory soon outgrew its cramped accommodation on the top floor of 343 Madison avenue and in 1895 it was moved to the top floor of No. 518 Fifth avenue. In 1896 Dr. Gregory was appointed full Professor of Botany and Dr. Herbert M. Richards was called to assist her. Together they had planned the new courses and laboratories in Brinckerhoff Hall, but Dr. Gregory did not live to see them completed, dying on April 21, 1897, just as the arrangements for moving her residence and laboratory had been

made. She will be missed at the meetings of the Torrey Club at which she read several original papers. She has been connected with the BULLETIN as associate editor since 1889 and has contributed thirty-five articles and reviews to its volumes, beginning in 1886. She was also an occasional contributor to the Botanical Gazette and an active member of the Society of American Naturalists, whose yearly meetings she frequently attended. She was elected a member of the American Association for the Advancement of Science in 1892, having attended the meeting at Rochester of that year and read a paper before the Botanical Section. She had also studied for a brief period at Woods Holl, where she had planned to spend the coming season. Her death leaves the botanical laboratory without any natural successor, though its founders hope that one may be secured who will continue the policy which she so ably represented.

The following minute was adopted by the Executive Committee of the Board of Trustees of Barnard College at their meeting on Thursday, April 22, 1897:

Professor Gregory gave to Barnard College, through the eight years of its existence, a service in the highest degree loyal, enthusiastic and successful. Her influence in creating and maintaining a high standard in scientific work was of great importance in determining the character of the college. She had the good fortune to possess, together with great intellectual gifts, the graces of character to make them effective, and her scholarship was in the service of kindliness, of courage and of truth. The college bears witness not only to her love of sound learning, but to the modesty and openness of mind which were the rare and beautiful setting of her powers.

The following preamble and resolutions were adopted by the Club at its meeting, held May 11, 1897:

WHEREAS: our esteemed fellow-member, Miss Emily L. Gregory is lost to us by death, therefore it is

*Resolved:* that in realization of our loss we express our deep sorrow for this sad event, at this untimely period when she was just about to enter upon a new era in her career as a teacher, to which we all, with her, had looked forward with happiest anticipation, and

*Resolved:* that we have lost in her an accomplished scientist, a devoted teacher, a warm hearted, generous friend, and

*Resolved:* that a copy of these resolutions be presented to her surviving relatives, to whom we extend our sincerest sympathies.

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## Studies in the Botany of the Southeastern United States.—X.

By JOHN K. SMALL.

## THE GENUS TRADESCANTIA IN THE SOUTHERN STATES.*

Six years' experience with *Tradescantia*, both in the field and in the herbarium, has convinced me that there is something fundamentally wrong in the several existing treatments of the genus. Since I became interested in the forms occurring in the Southern States Dr. J. N. Rose has arranged to monograph the North American Commellinaceae and I publish these notes with his knowledge and consent.

Linnaeus described a single North American species, namely, *T. Virginiana.*† Of American authors, Walter,‡ Michaux,§ Pursh,‖ Elliott ¶ and Darby,** each described two species, while Chap-

* I have had the privilege of examining material in the herbaria of Lafayette College, through Professor Thos. C. Porter, and of Franklin and Marshall College, through Professor J. S. Stahr. Professor S. M. Tracy has sent me specimens at various times. I have also received material from regions beyond the area with which this paper is concerned, from Mr. B. F. Bush, Rev. E. J. Hill and Rev. J. M. Bates.

† Sp. Pl. 288.

‡ Fl. Car. 119.

§ Fl. Bor. Am. 119.

‖ Fl. Am. Sept. 218.

¶ Bot. S. C. & Ga. 380–381.

** Bot. S. States, 547–548.

man* added a third, *Tradescantia pilosa*. With the exception of Walter all these authors used the same two specific names, applying Ventenat's *Tradescantia rosea* properly and making *Tradescantia Virginiana* elastic enough to embrace everything else savoring of *Tradescantia* that existed in their respective regions. Walter applied the name *Virginica* not to the Linnaean type, but to the form that Ventenat later described as *Tradescantia rosea* and proposed the name *cristata* for one of the larger forms which most authors thought was the real *Tradescantia Virginiana* of Linnaeus, but judging from Walter's description I am inclined to think he had in mind a later described species.

Rafinesque's work on the southern *Tradescantias* must needs be mentioned. This eccentric author described no less than twenty-six species and varieties in eastern North America, thus treating the genus from the standpoint of extreme segregation just as the authors mentioned above treated it from the standpoint of extreme aggregation. Rafinesque apparently founded a species on nearly every specimen he collected and of course his work needs extensive reduction, but to what previously described species to refer many of the Rafinesquian names is a difficult task. However, several of the forms he described, prove to be excellent species, for example, *Tradescantia brevicaulis* which Dr. Morong restored several years ago † and *Tradescantia reflexa* which I restore in this paper.

An attempt to segregate the material in an herbarium on the lines laid down in the several different works above referred to must at once prove futile and not until we recognize the several segregates into which the *Virginiana* type naturally separates itself can we hope for a clear or scientific interpretation of the group from a specific standpoint.

**Key to the Species.**

Umbel-like cymes peduncled, subtended by small or minute bracts.

Leaves ovate or ovate-lanceolate; sepals 2–3 mm. long. 1. *T. Floridana.*

Leaves linear or almost filiform; sepals 5–6 mm. long. 2. *T. rosea.*

Umbel-like cymes sessile, subtended by large leaf-like bracts.

Leaves linear or linear-lanceolate, 12–50 times longer than broad, more or less involute; plants glabrous, villous, hirsute or glandular.

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* Fl. S. States, 498.

† Bull. Torr. Club, 20: 470.

Stems abbreviated, 1 to rarely 10 cm. long; bracts longer than the leaves. 3. *T. brevicaulis.*

Stems elongated, 20–100 cm. long; bracts shorter than the leaves.

Sheaths not imbricated at the base of the stem.

Stem glabrous; pubescence, when present on other organs, villous and silvery.

Plant bright green; pedicels 2.5–5 cm. long, villous; sepals 12–18 mm. long, villous, about twice as long as broad, becoming membranous. 4. *T. Virginiana.*

Plants glaucous; pedicels 2–2.5 cm. long, glabrous; sepals 8–10 mm. long, with a tuft of hairs at the apex, 3–4 times as long as broad, leathery. 5. *T. reflexa.*

Stem hirsute; pubescence brownish. 6. *T. hirsuticaulis.*

Sheaths imbricated for 5–20 cm. at the base of the stem.

Plant densely glandular; sepals linear-lanceolate or linear-oblong, 1 cm. long. 7. *T. longifolia.*

Plant glabrous except the villous sheaths at the base of the stem; sepals ovate or oblong, 7 mm. long. 8. *T. foliosa.*

Leaves lanceolate or narrowly lanceolate, 4–10 times longer than broad, flat; plants glabrate, pilose or villous.

Stem clothed with long villous hairs. 9. *T. comata.*

Stems glabrous, or pilose.

Plant usually slender; stems mostly strict; umbels solitary and terminal or on corymbed branches; flowers 2–2.5 cm. broad; species Alleghenian. 10. *T. montana.*

Plant usually stout; stems mostly flexuous; umbels terminal and sessile in the upper axils; flowers 2.5–3 cm. broad; species campestrian. 11. *T. pilosa.*

### 1. Tradescantia Floridana S. Wats.

*Tradescantia Floridana* S.Wats. Proc. Am. Acad. 17: 381. 1882.

Perennial by creeping stems, slender, nearly glabrous, bright green. Stems procumbent, more or less matted, flaccid, 1–3 dm. long, rooting at the lower nodes; leaves ovate or ovate-lanceolate, 1–2 cm. long, thinnish, acute, ciliolate; sheaths funnelform, minutely roughened, fringed with long white cilia; cymes solitary or 2 together, terminal, their peduncles .5–1.5 cm. long, subtended by ovate or ovate-lanceolate bracts; pedicels filiform, 2–6 mm. long, villous and somewhat glandular; sepals ovate, about 2–3 mm. long, acutish, purple, pubescent; petals white; filaments glabrous; anther-cells contiguous; capsules oval, nearly 2 mm. long, glabrous.

Damp shady places, peninsular Florida: Miss Reynolds; Merritt's Island, A. H. Curtiss, 2995 (two collections under the one

number); Sumpter county, J. D. Smith; Indian River, W. M. Canby.

2. TRADESCANTIA ROSEA Vent.

*Tradescantia Virginica* Walt. Fl. Car. 119. 1788. Not *T. Virginiana* L.

*Tradescantia rosea* Vent. Hort. Cels, *pl. 24.* 1800.

Perennial by rootstocks, slender, nearly glabrous, bright green. Stems erect or nearly so, often densely tufted, 1–5 dm. tall, usually simple; leaves narrowly linear or nearly filiform, 1–3 dm. long, flat or involutely folded, acuminate, sometimes surpassing the peduncles; sheaths cylindric or funnelform, .5–1 cm. long, fringed with long white cilia; cymes usually solitary, or sometimes 2 together, terminal, their peduncles 8–15 cm. long, subtended by linear bracts; pedicels 1–1.5 cm. long, glabrous; sepals lanceolate or ovate-lanceolate, 5–6 mm. long, acutish, petals pink or rose-color, orbicular-oblong, obtuse; filaments glabrous, anther-cells contiguous; capsules subglobose, 4–5 mm. in diameter.

Sandy soil, Maryland to Missouri, south to Florida and Texas. Spring and summer.

3. TRADESCANTIA BREVICAULIS Raf.

*Tradescantia brevicaulis* Raf. Atl. Journ. 150. 1832.

*Tradescantia pumila* Raf. New Fl. Part 2, 86. 1836.

*Tradescantia Virginica* var. *villosa* S. Wats.; Wats. & Coult. in A. Gray, Man. Ed. 6, 539. 1890.

Perennial by a cluster of slender roots, low, stoutish, more or less villous, bright green. Stems solitary or usually clustered, erect, almost wanting or 1–10 cm. tall, simple; leaves linear or narrowly linear, 1.5–3 dm. long, flattish, acute or sometimes rather obtuse, sheaths 1–2.5 cm. long, mostly imbricated; involucre of 2 nearly equal leaf-like bracts which are longer and broader than the leaves; pedicels stoutish, 3.5–5.5 cm. long, villous; flowers mostly purplish-blue, 5–15 in an umbel-like cyme, about 2 cm. broad; sepals ovate or oblong-ovate, 10–11 mm. long, obtuse; petals suborbicular, obtuse, delicately nerved; mature capsule not seen.

Hillsides and woods, Illinois to Missouri and Kentucky. May to June.

4. TRADESCANTIA VIRGINIANA L.

*Tradescantia Virginiana* L. Sp. Pl. 288. 1753.

*Tradescantia rupestris* Raf. Atl. Journ. 150. 1832.

Perennial by a cluster of rather thick white or yellowish roots, stout or stoutish, glabrous or nearly so, bright green. Stems

usually clustered, erect, 2 dm. or mostly 3–4 dm. tall, nearly straight, simple; leaves linear or linear-lanceolate, 1 or usually 2–7 dm. long, acuminate, more or less curved, nearly flat or involutely folded; sheaths 1–3 cm. long, sometimes slightly ciliate; involucre of 2 lanceolate or linear-lanceolate nearly equal or very unequal leaf-like bracts which are usually much smaller than the leaves; flowers dark blue or purplish or rarely white, large, 3–4 cm. broad; pedicels 2.5–5 cm. long, sepals large, elliptic, ovate or ovate-lanceolate, 12–18 mm. long, obtuse or acutish, villous with long non-glandular hairs about twice as long as broad, becoming membranous; petals sub-orbicular, 1.4–2 cm. in diameter; capsule 5–7 mm. long, glabrous; seeds oblong, about 3 mm. long.

Hillsides and along streams, New York and Illinois, Virginia nd Arkansas. May–June.

5. TRADESCANTIA REFLEXA Raf.

? *Tradescantia canaliculata* Raf. Atl. Journ. 150. 1832.

*Tradescantia reflexa* Raf. New Fl. Part 2, 87. 1836.

*Tradescantia reflexa* var. *drepisia* Raf. New Fl. Part 2, 88. 1836.

Perennial by a rootstock and numerous rather delicate roots, slender or stout, glabrous, glaucous. Stems solitary, erect, 4–9 dm. tall, nearly straight, commonly much branched, sometimes purplish; leaves linear, 2–5 dm. long, straight, or somewhat curved, long attenuate; sheaths large, 1–3 cm. long, glabrous or rarely slightly villous; involucres of 2 unequal finally reflexed leaf-like bracts; flowers blue, or often red, 2–3 cm. broad, the umbel-like cymes at maturity usually dense; pedicels slender, 2–2.5 cm. long, crowded; sepals oblong or elliptic, apparently lanceolate by the involute edges, 8–10 mm. long, hooded, mostly with a tuft of hairs at the apex, sometimes glabrate, 3–4 times as long as broad, leathery; petals suborbicular; capsule ovoid or oblong, 5–6 mm. long, glabrous, constricted above the middle; seeds oblong, 3 mm. long, with irregular transverse ridges.

In sandy or clay soil, in the Gulf States and from South Carolina to Indian Territory and Texas; ascends the Mississippi Valley to Minnesota. May–August.

South Carolina: Elliott; Georgia: Small; Florida: Garber, Nash; Alabama: Earle and Underwood; Mississippi: Tracy; Texas: Drummond; Indian Territory: Palmer.

Conspicuous on account of its tall and proportionately slender habit, its narrow elongated leaves and usually very dense flower clusters. I have adopted the specific name *reflexa* of Rafinesque

because the original description agrees very well with the specimens I have collected in the Southern States and the original locality lies within the bounds of the range shown by my specimens. The plant is usually glabrous except a more or less distinct tuft of hairs near the apex of the sepals.

### 6. Tradescantia hirsuticaulis n. sp.

Perennial by a cluster of coarse elongated (1–2.5 dm.) roots, slender, hirsute throughout with long brownish hairs, or partially glabrous above, otherwise bright green. Stems several together, erect or nearly so, 3–4 dm. tall, leafy throughout, densely hirsute, simple; leaves narrowly linear, 2–3 dm. long, more or less curved, involutely folded, less densely hirsute than the stem; sheaths rather pale, 1–2.5 cm. long, conspicuously ribbed; involucre of two linear very unequal leaf-like bracts which are somewhat smaller than the stem leaves; pedicels slender, 2–2.5 cm. long; flowers purple, large, 2.5–3 cm. broad; sepals variable in the same flower, ovate or lanceolate, 9–15 mm. long, rather villous and somewhat glandular; petals suborbicular, broader than long and undulate; mature capsule not seen.

Sandy places, Georgia to Florida; occurs at 400 meters on Stone Mountain. May to July.

Florida: Chapman, Wood; Georgia: Stone Mountain, Small. A very distinct and beautiful species related to *Tradescantia reflexa* but much more slender in habit. Remarkable for the abundant development of brownish hirsute pubescence on the stem, leaves and inflorescence. The flowers are larger and of a deeper blue than those of *Tradescantia reflexa*.

### 7. Tradescantia longifolia n. sp.

Perennial by a short rootstock and slender roots which are 1 dm. or rarely 2 dm. long; rather slender, glandular-pilose, dull green. Stems solitary, erect or assurgent, 4–5 dm. tall, strict, simple or sparingly branched above, densely glandular; leaves linear or nearly so, chiefly basal or confined to the lower part of the stem, 2–4 dm. long, even the lower ones surpassing or almost equalling the stem, gradually narrowed from near the base, flat, densely glandular-pilose like the stem; sheaths 2–2.5 cm. long, ciliate with long hairs, imbricated below; involucre of two small leaf-like bracts, or one often almost wanting; pedicels stoutish, 1.5–2 cm. long; flowers deep blue, 2.5–3 cm. broad; sepals linear-lanceolate or linear-oblong, 1 cm. long, obtuse, 1½ to 2 times shorter than the pedicels; filaments at length as long as the sepals,

spirally twisted; capsule oblong, 8–9 mm. long, glandular-pilose; seeds oblong or ovoid, more or less flattened, gray, conspicuously marked with irregular transverse ridges.

Sandy soil in pine barrens, Florida: Curtiss, 2996 and 4680; Nash, 1574.

Many *Tradescantias* possess more or less glandular pubescence, but in this Floridian species, we find the whole plant covered with a short glandular pubescence which extends even to the petals. Its affinities are with *Tradescantia hirsuticaulis*, from which it differs primarily in the pubescence and the broader and elongated leaves which are chiefly confined to the base of the stem which they either surpass or nearly equal. The sepals are narrow and conspicuously elongated.

8. TRADESCANTIA FOLIOSA n. sp.

Perennial by a cluster of slender much elongated (more than 3 dm.) roots, rather stout, glabrous above, villous at the base, dull green. Stems solitary, erect, 4–7 dm. tall, simple or nearly so, very leafy near the base, glabrous or glabrate; leaves narrowly linear, 2–6 dm. long, nearly equalling or surpassing the stem, long-attenuate, crowded at the base; sheaths large, often densely villous, imbricated and sheathing the stem for 1–2 dm., prominently ribbed; involucre of 3 unequal leaf-like bracts; pedicels slender, 1–1.5 cm. long; flowers blue, about 2 cm. broad, the cymes at maturity dense; sepals ovate or oblong, about 7 mm. long, obtuse, two strongly hooded and with a tuft of hairs near the apex, one scarcely hooded and nearly glabrous at the apex; capsule oblong, 5–6 mm. long, glabrous; seeds irregular, 2–2.5 mm. long, not much longer than broad.

In clay soil, chiefly on hummocks, eastern and southern Florida: Keeler; Nash, 610 in part. May to June.

As in the case of *Tradescantia longifolia*, the leaves of this plant are crowded toward the base of the stem but they are much more numerous. The sheaths are loose, densely imbricated and villous, with very long delicate hairs. The upper part of the plant is apparently glaucous, the flowers are small, the sepals short and the fruiting calyx small and plump. The plant is destitute of glandular pubescence.

9. TRADESCANTIA COMATA n. sp.

Perennial, stoutish, pubescent with long villous hairs. Stems erect or ascending, 3–5 dm. tall, simple or sparingly branched,

very villous; leaves lanceolate or narrowly-lanceolate, 1–3 dm. long, acute or short-acuminate, ciliate, villous on both surfaces or glabrate above, somewhat narrowed near the base; sheaths villous like the stem, 1–3 cm. long; involucre of 1–2 bracts like the leaves but smaller; flowers blue, 1.5–2 cm. broad; pedicels usually densely villous; sepals oblong or elliptic-oblong, 7–9 mm. long, villous, acute or acutish; capsules oblong, 4–5 mm. long, glabrous; seeds oblong, 3 mm. long, tuberculate-ridged.

Upper districts and mountains of Georgia; Chapman, two collections.

Allied to *Tradescantia montana*, but readily distinguished by the conspicuous villous pubescence.

### 10. Tradescantia montana Shuttl.

*Tradescantia montana* Shuttl.; Britton, in Britton & Brown, Ill. Fl. 1: 377. 1896.

Perennial by a cluster of elongated roots, slender, nearly glabrous, dark green. Stems usually solitary, erect, 3–7 dm. tall, straight or nearly so, simple or sparingly branched above; leaves narrowly lanceolate or linear-lanceolate, 1–3 dm. long, usually minutely pubescent, or rarely glabrate, acuminate, flat; sheaths 1–2 cm. long, ciliate; involucre of two lanceolate leaf-like bracts, one of which is at least one-half smaller than the other; flowers blue, small, 2–2.5 cm. broad; pedicels slender, 1–1.2 cm. long; sepals ovate or oblong, sometimes apparently lanceolate by the involute edges, 5–6 mm. long, pilose or villous, obtuse, hooded, often minutely glandular; petals sub-orbicular or orbicular-ovate; capsule oblong or oval, 5–6 mm. long, glabrous, or pilose especially above the middle; seeds oval-oblong, 3 mm. long, irregularly tuberculate and coarsely granular.

Sandy hillsides in the Allegheny mountains from Virginia to North Carolina and South Carolina; ascends to 1200 meters in North Carolina. June to August.

Virginia: Britton, Small; North Carolina: Rugel, Porter, Small & Heller; South Carolina: Small.

*Tradescantia montana* appears to be strictly Alleghenian in its distribution. It is more closely related to *Tradescantia pilosa* than to any other species, but it is smaller throughout, with a straight or almost straight stem, narrower and thinner leaves and usually less pubescence.

Last July I found this plant abundantly on Paris mountain, near Greenville, South Carolina. It grew on the upper slopes and

top of the mountain, chiefly in thickets. The species is apparently a late bloomer; although the season was far advanced the plants had not produced any capsules.

11. TRADESCANTIA PILOSA J. G. C. Lehm.

*Tradescantia pilosa* J. G. C. Lehm. Nov. Act. Leop. **14**: Part 2, 822. *pl. 48*. 1828.

*Tradescantia flexuosa* Raf. Atl. Journ. 150. 1832.

*Tradescantia axillaris* Raf. New Fl. Part 2, 87. 1836.

*Tradescantia axillaris* var. *flexuosa* Raf. New Fl. Part 2, 87. 1836.

*Tradescantia Virginica* var. *flexuosa* S. Wats.; Wats & Coult. in A. Gray, Man. Ed. 6: 539. 1890.

Perennial, stout, pilose and more or less puberulent, dull green; stems erect or ascending, 4–8 dm. tall, flexuous, often puberulent, or glabrate, leafy to the top, simple or sparingly branched; leaves lanceolate or sometimes rather narrowly lanceolate, 1–2.5 dm. long, acuminate, dark green above, paler beneath; sheaths 1–1.5 cm. long, ciliate, inconspicuously ribbed; involucre of 2–3 bracts similar to the leaves, one about twice as long as the others; pedicels normally slender, 1.5–2 cm. long, villous-pilose, or often glabrate; flowers pale blue or deep blue, large, 2.5–3 cm. broad, the cymes usually crowded at maturity; sepals ovate or oblong, about 7 mm. long, apparently lanceolate by their involute edges, two strongly hooded, the third not hooded, mostly villous-pilose; petals ovate-orbicular, obtuse; capsule globose-oblong, 5 mm. long, constricted at the middle, pilose at the summit; seeds oblong or ovoid, 2–3 mm. long.

Thickets and shady hillsides, Ohio to Missouri, south to West Virginia and Tennessee. Naturalized about Bartram's Garden, Philadelphia. May to August.

In size, habit and leaf form, especially in the breadth of the leaves, this is our most conspicuous *Tradescantia*; the lanceolate leaves with their pilose pubescence, the normally flexuous stems and the usually axillary flower-clusters readily separate it from all other species. In range it is campestrian with Kentucky and Tennessee as its center of distribution; it is unknown west of the Mississippi river except in eastern Missouri.

# Reinke's Discussions of Lichenology.—IV.

By Albert Schneider.

## IV. OUTLINES OF A COMPARATIVE MORPHOLOGY OF THE LICHEN THALLUS.*

Numbers IV. and V. of Reinke's papers treat of the same subjects, that is the polyphylogeny, relationships and comparative morphology of the genera.

The author considers the system of Tuckerman as being the nearest approach to a natural arrangement. Reinke's system differs in that the relative position of tribes as well as of the families and genera has been modified. While Tuckerman proceeded from the higher to the lower, Reinke bases his system on the reverse arrangement. The author wishes to have it distinctly understood that the proposed system is by no means perfect; it is only an attempt at a natural arrangement of lichens based upon the very deficient data obtained from the study of the phylogenetic history of these plants.

The profuse illustrations accompanying the papers represent the morphological characters of generic types. The illustrations of sections of the thalli and apothecia are more or less semi-diagrammatic, no attempt being made to give exact anatomical details, which is rather to be regretted in a work otherwise so complete. It seems also that the author has in many instances relied wholly upon the observations of others.

## V. THE NATURAL SYSTEM OF LICHENS.†

The author precedes the consideration of the arrangement of lichen groups by a lengthy theoretical discussion of the phylogenetic relationship of the groups to each other and to fungi. Much of it is a repetition of what had been stated in preceding papers. The same may be said of the general considerations of the sub-classes, families and genera.

*Reinke, J. Skizzen zu einer vergleichenden Morphologie des Flechtenthallus. Jahrbücher für wissenschaftliche Botanik, 28: 70–150, 359–486. 1895.

†Reinke, J. Das natürliche Flechtensystem. Jahrbücher für wissenschaftliche Botanik, 29: 171–236. 1896.

The following is the arrangement proposed by Reinke. The symbiotic algae and fungal affinities are deduced from a consideration of previous papers. The results plainly show that much is yet to be done in the investigation of the lichen-algae and in the study of the relationship of lichens to fungi.

## LICHENES.

| | Symbiotic Algae. | Approximate fungal affinities. |
|---|---|---|
| I. CONIOCARPI. | | |
| (*a*) *Caliciacei.* | | *Patellariacei.* |
| 1. Mycocalicium. | No algae. | (*Protocaliciacei.*) |
| 2. Calicium. | Pleurococcus. | |
| 3. Coniocybe. | " | |
| (*b*) *Acoliacei.* | | *Patellariacei.* |
| 1. Acolium. | Pleurococcus. | (*Protocaliciacei.*) |
| 2. Pyrgillus. | " | |
| 3. Tylophoron. | " | |
| 4. Tholurna. | " | |
| 5. Acroscyphus. | " | |
| 6. Pleurocybe. | " | |
| 7. Sphaerophoron. | " | |
| II. DISCOCARPI. | | |
| A. GRAMMOPHORI. | | |
| (*a*) *Graphidacei.* | | *Hysteriacei.* |
| 1. Melaspilea. | Chroolepus. | Mycomelaspilea. |
| 2. Arthonia. | " | Mycarthonia. |
| 3. Lecanactis. | " | Patinella. |
| 4. Placographa. | " | Mycoplacographa. |
| 5. Platygrapha. | " | |
| 6. Pachnolepia. | " | |
| 7. Opegrapha. | " | Hysterium. |
| 8. Graphis. | " | " |
| 9. Glyphis. | Protococcus. | |
| 10. Chiodecton. | Chroolepus. | |
| 11. Schizopelte. | " | |
| 12. Dendrographa. | " | |
| 13. Dirina. | " | |
| 14. Rocella. | " | |
| 15. Combea. | " | |
| (*b*) *Xylographacei.* | | *Hysteriacei.* |
| 1. Xylographa. | Pleurococcus. | |
| B. LECIDIALES. | | |
| (*a*) *Gyalectacei.* | | *Patellariacei.* |
| 1. Coenogonium. | Cladophora. | (*Stictideae.*) |
| 2. Gyalecta. | Protococcus. / Chroolepus. | |
| 3. Jonaspis. | Chroolepus. | |
| (*b*) *Lecideacei.* | | *Patellariacei.* |
| 1. Lecidea. | Pleurococcus. | Patinella. |
| 2. Biatora. | " | |
| 3. Bacidia. | " | Mycobacidea. |
| 4. Thalloidima. | Protococcus. | |
| 5. Sphaerophoropsis. | Gloeocystis. | |
| 6. Toninia. | | |

| | | |
|---|---|---|
| 7. Bombylospora. | | |
| 8. Lopadium. | | |
| (*c*) *Umbilicariacei.* | | *Patellariacei.* |
| 1. Psora. | Protococcus. | |
| 2. Umbilicaria. | | |
| (*d*) *Cladoniacei.* | | *Patellariacei.* |
| 1. Icmadophila. | Protococcus. | |
| 2. Pilophoron. | " | |
| 3. Stereocaulon. | " | |
| 4. Argopsis. | " | |
| 5. Pycnothelia. | " | |
| 6. Baeomyces. | " | |
| 7. Cladonia. | " | |
| 8. Glossodium. | " | |
| 9. Thysanothecium. | " | |
| 10. Sphyridium. | " | |
| 11. Gymnoderma. | " | |
| 12. Gomphillus. | " | |
| C. PARMELIALES. | | |
| (*a*) *Urceolariacei.* | | *Stictideae.* |
| 1. Conotrema. | Chroolepus. | |
| 2. Ascidium. | " | |
| 3. Gyrostomum. | " | |
| 4. Thelotrema. | " | |
| 5. Polystroma. | Protococcus. | |
| 6. Belonia. | | |
| 7. Urceolaria. | Protococcus. | |
| (*b*) *Pertusariacei.* | | *Patellariacei.* |
| 1. Megalospora. | Pleurococcus. | |
| 2. Ochrolechia. | Protococcus. | |
| 3. Pertusaria. | " | |
| 4. Varicellaria. | | |
| 5. Phlyctis. | | |
| (*c*) *Parmeliacei.* | | *Patellariacei.* |
| 1. Lecanora. | Protococcus. | |
| 2. Parmelia. | " | |
| 3. Cetraria. | " | |
| 4. Dactylina. | " | |
| 5. Evernia. | " | |
| 6. Usnea. | " | |
| 7. Cornicularia. | " | |
| 8. Alectoria. | " | |
| 9. Heterodea. | " | |
| 10. Ramalina. | " | |
| (*d*) *Physciacei.* | | *Patellaricei.* |
| 1. Buellia. | Pleurococcus. | Karschia. |
| 2. Rinodina. | Protococcus. | |
| 3. Pyxine. | " | |
| 4. Physcia. | " | |
| 5. Anaptychia. | " | |
| (*e*) *Theloschistacei.* | | *Patellariacei.* |
| 1. Callopisma. | Protococcus. | Karschia ? |
| 2. Candelaria. | " | |
| 3. Placodium. | " | |
| 4. Xanthoria. | " | |
| 5. Theloschistes. | " | |
| (*f*) *Acarosporacei.* | | |
| 1. Biatoridium. | Pleurococcus. | |
| 2. Acarospora. | Protococcus. | |
| 3. Anzia. | " | |
| 4. Thelocarpon. | " | |

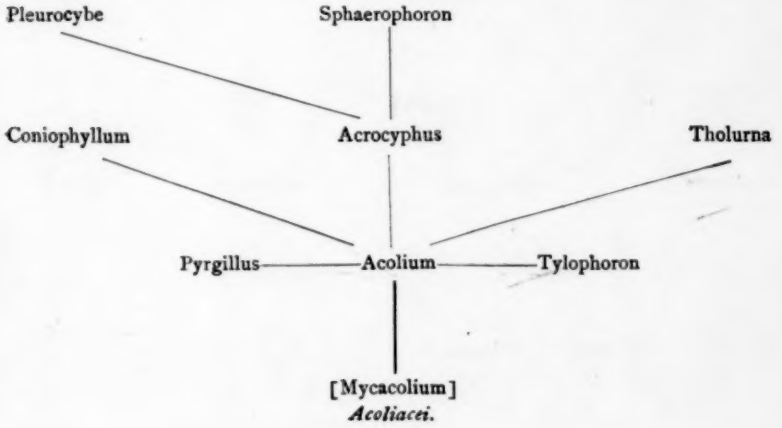
| | | |
|---|---|---|
| D. CYANOPHILI. | | |
| (*a*) *Lichinacei.* | | *Patellariacei.* |
| 1. Calothricopsis. | Rivularia. | Patinella ? |
| 2. Lichina. | " | |
| (*b*) *Ephebacei.* | | |
| 1. Thermutis. | Scytonema. | |
| 2. Pterigiopsis. | | *Patellariacei.* |
| 3. Ephebe. | Stigonema. | Patinella. |
| 4. Spilonema. | " | |
| 5. Lichenosphaeria. | " | |
| (*c*) *Pannariacei.* | | *Patellariacei.* |
| 1. Parmeliella. | Nostoc. | |
| 2. Placynthium. | Scytonema. | |
| 3. Polychidium. | " | |
| 4. Leptodendriscum. | " | |
| 5. Leptogidium. | " | |
| 6. Pannaria. | Protococcus. | |
| 7. Heppia. | Scytonema. | |
| 8. Heterina. | " | |
| 9. Coccocarpia. | " | |
| 10. Hydrothyria. | " | |
| 11. Erioderma. | " | |
| 12. Psoroma. | Protococcus. | |
| 13. Lepidocollema. | " | |
| 14. Leprocollema. | Nostoc. | |
| (*d*) *Stictacei.* | | *Patellariacei.* |
| 1. Massalongia. | Nostoc. | |
| 2. Stictina. | " | |
| 3. Sticta. | Protococcus. | |
| 4. Ricasolia. | " | |
| (*e*) *Peltigeracei.* | | *Patellariacei.* |
| 1. Peltigera. | Protococcus. | |
| 2. Peltidea. | " | |
| 3. Nephromium. | Nostoc. | |
| 4. Nephroma. | Protococcus. | |
| 5. Solorinina. | Nostoc. | |
| 6. Solorina. | Protococcus. | |
| 7. Solorinella. | | |
| (*f*) *Collemacei.* | | *Patellariacei.* |
| 1. Lecidocollema. | Nostoc. | |
| 2. Pyrenocollema. | " | |
| 3. Collema. | " | |
| 4. Leptogium. | " | |
| (*g*) *Omphalariacei.* | | *Patellariacei.* |
| 1. Cryptothele. | Gloeocapsa. | |
| 2. Pyrenopsis. | " | |
| 3. Synalissa. | " | |
| 4. Peceania. | | |
| 5. Phylliscidium. | Chroococcus. | |
| 6. Paullia. | Gloeocapsa. | |
| 7. Omphalaria. | Chroococcus. | |
| 8. Anema. | " | |
| 9. Psorotichia. | | |
| 10. Euchylium. | | |
| 11. Collemopsidium. | | |
| 12. Pyrenopsidium. | | |
| 13. Phylliscum. | Chroococcus. | |
| III. PYRENOCARPI. | | |
| (*a*) *Verrucariacei.* | | *Sphaeriaceae.* |
| 1. Verrucaria. | Chroolepus. | |
| 2. Strigula. | " | |

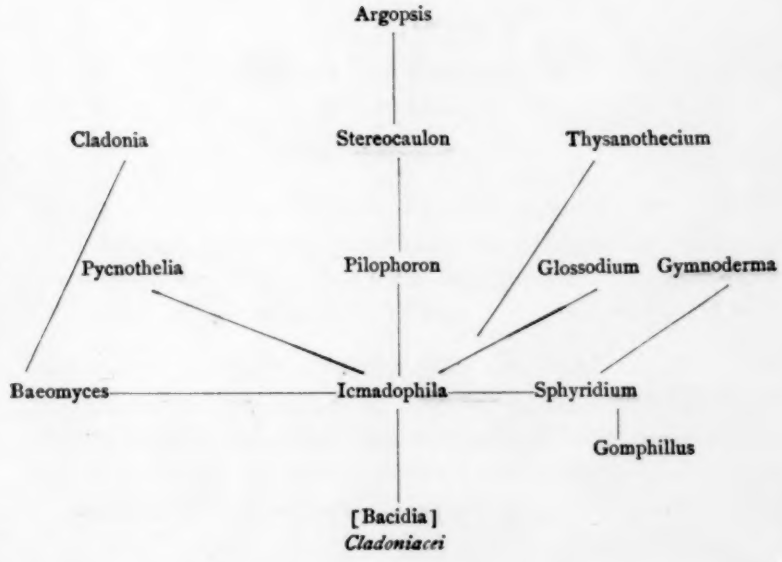
| | |
|---|---|
| 3. Endopyrenium. | Chroolepus. |
| 4. Endocarpon. | " |
| 5. Pyrenothamnia. | " |

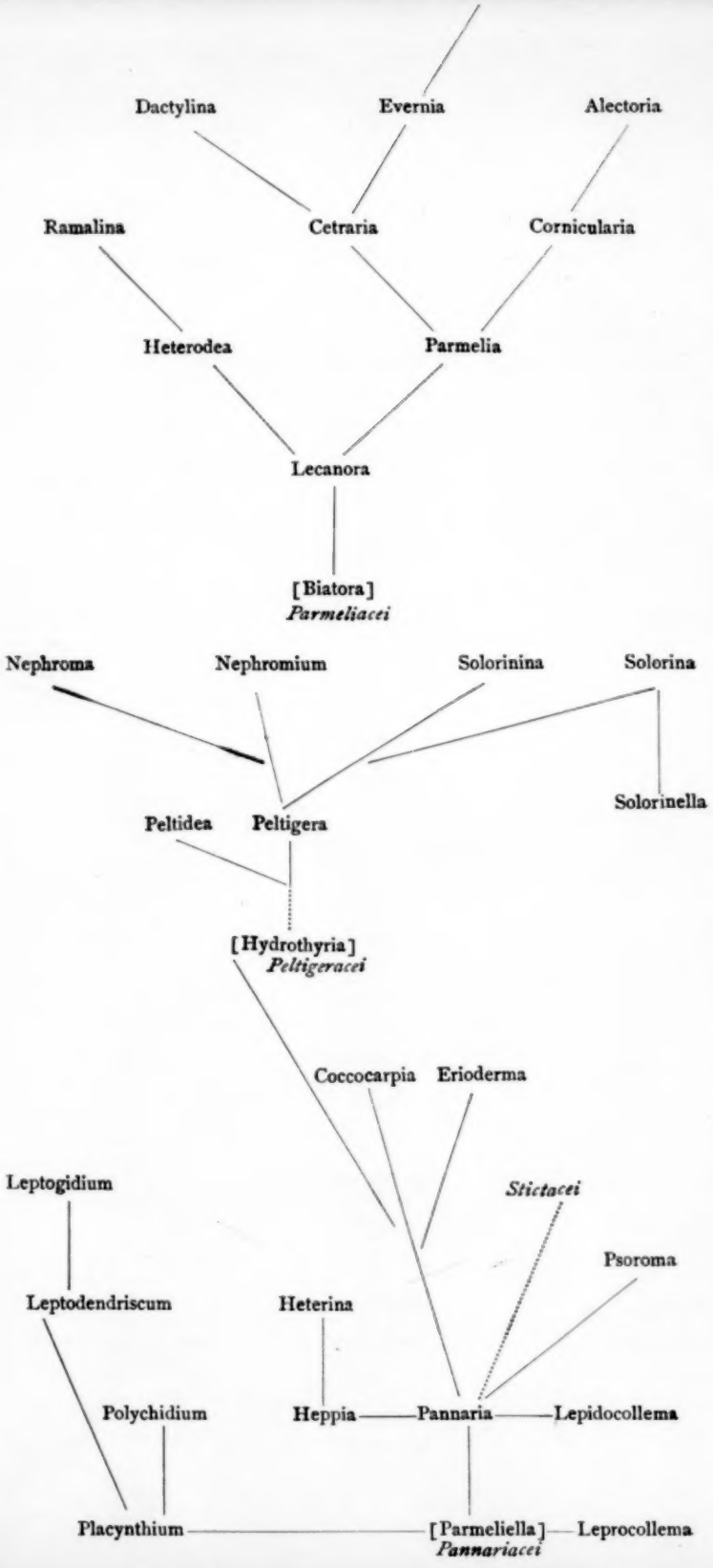
LICHENES IMPERFECTI.

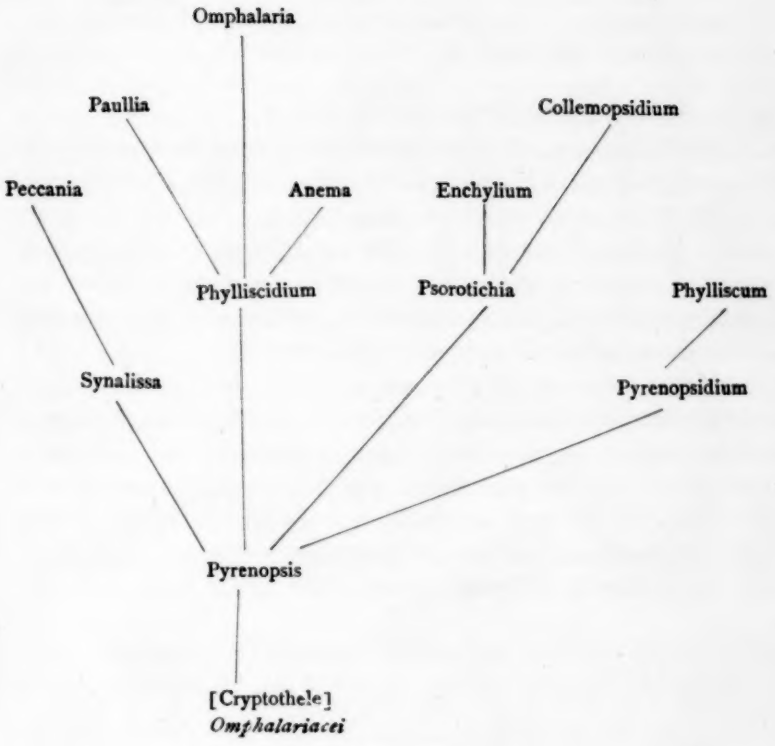
| | |
|---|---|
| 1. Thamnolia. | Protococcus. |
| 2. Siphula, etc. | |

The following diagrams show the probable phylogenetic relationships of the genera of some of the families. The remaining families are not sufficiently well understood to indicate this relationship.




Dactylina
Evernia
Alectoria
Ramalina
Cetraria
Cornicularia
Heterodea
Parmelia
Lecanora
[Biatora]
Parmeliacei
Nephroma
Nephromium
Solorinina
Solorina
Solorinella
Peltidea
Peltigera
[Hydrothyria]
Peltigeracei
Coccocarpia
Erioderma
Leptogidium
Stictacei
Psoroma
Leptodendriscum
Heterina
Polychidium
Heppia
Pannaria
Lepidocollema
Placynthium
[Parmeliella]
Leprocollema
Pannariacei




## Rarieties from Montana.—II.

By P. A. Rydberg.

(Plates 304–307.)

Polygonum Austinae Greene, Bull. Cal. Acad. 2: 212. 1885.*

This little interesting *Polygonum* was collected on the side of one of the highest peaks of the Crazy Mountains, September 8, 1896, at an altitude of 8000 feet.

Polygonum Engelmannii Greene, Bull. Cal. Acad. 1: 126. 1884.

This has hitherto only been collected in the higher mountains of Colorado. It is not uncommon in central Montana at an altitude of 6000 feet or more. Cottonwood Creek, July 30, 1896,

* This and the next have been determined by J. K. Small.

Flodman, no. 400. Sweet Grass Cañon, Crazy Mountains, September 8th, no. 399.

SILENE REPENS Patrin, in Pers. Syn. 1: 500. 1805.

This Siberian species has been collected in Montana at the following stations: Spanish Basin, July 11, 1896, Flodman, no. 412; Mystic Lake, Bozeman Cañon, July 24, 1895, Rydberg, no. 2635. As far as I can find, there is no reference in print regarding its occurrence in America. Dr. B. L. Robinson, to whom the specimens were sent for identification and who has determined it as well as the next following species, writes:

"Your specimens of *S. repens* are very interesting. I have seen specimens from Alaska, but never before from other parts of North America. I have no doubt, however, of the identity of your plants with the real Asiatic plant, having just made careful dissections of the two alongside of each other. However, the matter of distribution is not so surprising after the discovery of *Stellaria dichotoma* in Montana some years ago."

ALSINE CALYCANTHA (Ledeb.)

*Arenaria calycantha* Ledeb. Mem. Acad. St. Petersb. 5: 534. 1812.

*Stellaria calycantha* Bong. Veg. Ins. Sitcha, 127. 1831.

This species was collected in a damp place just below a little patch of snow near the top of Yogo Baldy in the Little Belt Mountains, August 24, 1896, Flodman, no. 432.

ALSINE LONGIPES EDWARDSII R. Br.

*Stellaria Edwardsii* R. Br., Parry's 1st Voy. 271.

This is, I think, the first time this variety is reported from within the United States. Only a few specimens were collected, at an altitude of 8000 feet on Spanish Peaks, July 14, 1896, Flodman, no. 429.

ARENARIA SUBCONGESTA (Wats.)

*Arenaria Fendleri subcongesta* Wats. Bot. King's Exp. 40. 1871.

*A. congesta subcongesta* Wats. Bot. Cal. 1: 69. 1876.

*Arenaria congesta subcongesta* as generally understood, I think, contains more than one distinct type; at least, that is the case

with the material in the Columbia herbarium. The form represented by Watson's original from the King Expedition and the common plant of Montana, I think, is perfectly distinct from both *A. Fendleri* and *A. congesta*, and the relationship is rather with *A. capillaris*. Depauperate specimens of *A. subcongesta* resemble strikingly *A. capillaris nardifolia*. It differs, however, in the scarious bracts and the more acute sepals, which are nearly as broad as in *A. capillaris*. It surprises me that it ever could have been made a variety of *A. Fendleri*, which has very narrowly lanceolate attenuate sepals. I do not see any reason for uniting it with *A. congesta*, which has lanceolate, decidedly carinate sepals and headlike inflorescence, while in *A. subcongesta* the sepals are ovate rather than lanceolate, are not carinate, but three-nerved, and the inflorescence is open. As stated before, it comes in every respect nearer to *A. capillaris*, but I think it has just as good right to specific rank as any of the species mentioned.

*A. subcongesta* is common in central and southwestern Montana. Flodman, nos. 433 to 438, Rydberg, 2642, etc.

AQUILEGIA JONESII Parry, Am. Nat. **8**: 211. 1874.

This rare little columbine was collected in fruit on a mountain top near the Neihart Pass in the Little Belt Mountains, August 10, 1896, Flodman, no. 451.

ATRAGENE TENUILOBA (Gray) Britton, Bull. Herb. Boiss. 3: 206. 1895.

*Clematis alpina* var. *occidentalis* subvar. *tenuiloba* A. Gray in Newton & Jenney, Rep. Geol. Black Hills, 531. 1880.

*Clematis Pseudoatragene* var. *subtriternata* Kuntze, Verh. Bot. Ver. Prov. Brand. **26**: 160. 1884.

This species has been reported hitherto only from the Black Hills and Colorado Mountains. In the Little Belt Mountains near Neihart Pass, at an altitude of 7000 ft., Aug. 10, 1896, Flodman no. 467; also near Helena in 1895, Rydberg, no. 2652.

RANUNCULUS SABINI R. Br. in Parry's 1st Voy. App. 264.

Specimens collected near the snow on Long Baldy, altitude 8000 ft. in the Little Belt Mountains, agree fully with the description of R. Brown's species. It is not to be referred to *R. pyg-*

*maeus*, neither does Brown's description, especially that of the flower, agree with that species. Flodman, no. 469.

RANUNCULUS SUKSDORFII Gray, Proc. Am. Acad. 21: 371.

The range of this species is much extended eastward by its discovery on the Spanish Peaks at an altitude of 8000 ft., July 14, 1896, Flodman, no. 471.

RANUNCULUS SUBAFFINIS (Gray).

*R. Arizonicus subaffinis* Gray, Proc. Am. Acad. 21: 370. 1886.
*R. subsagittatus subaffinis* Greene, Pittonia, 2: 110. 1890.

The author agrees fully with Prof. Greene that both the varieties of *R. Arizonicus* ought to be removed from that species, but is inclined to believe that *subaffinis* is specifically distinct from *subsagittatus*. I have seen Prof. Greene's specimens from the San Francisco Mountains, as well as others collected by Dr. Mearns and by Mr. Wooton in the same region; Flodman's no. 472, from the Bridger Mountains, July 28, 1896, agrees in every respect with them.

CARDAMINE UNIJUGA n. sp.

Stem from a very slender rootstock, slender, glabrous, simple, strict, 2–3 dm. high; basal leaves simple, about ½ cm. in diameter, broadly cordate or reniform in outline, round-sinuately 3-lobed; lower stem leaves with a pair of oblong leaflets below the terminal one, which resembles the basal leaves or is a little more rhomboid in outline; upper leaves similar but with all the leaflets oblong; raceme slender and narrow; flowers about 2 mm. in length, white; sepals ovate, obtuse; fruiting pedicels about 1 dm. long, nearly erect; silique erect, 15–18 mm. long and about 1 mm. wide, with a short thick style and 8–12 seeds. (Plate 304.)

The inflorescence and the silique much resemble those of *C. oligosperma*, but the plant is more slender and simple and the leaves in all specimens seen have only one pair of leaflets and the basal ones are simple, while in *C. oligosperma* the basal and lower stem leaves have 3–5 pairs. Spanish Basin, July 18, 1896, Flodman, no. 494.

CARDAMINE LEIBERGII Holz. Cont. U. S. Nat. Herb. 3: 212. 1895.

This species was rediscovered by myself in 1895, but only a few specimens were preserved. It was growing in cañons at two

widely separated stations, viz., near Lima, in Beaverhead County, no. 2663, and in Bozeman Cañon in Gallatin County, no. 2664. It resembles a depauperate *C. Breweri*, but differs in the much thicker and more angular toothed leaves. The latter species is very common in Montana.

LESQUERELLA ALPINA (Nutt.) Wats. Proc. Am. Acad. 23: 254 1888.

*Vesicaria alpina* Nutt; T. & G. Fl. N. Am. 1: 102. 1838.

The true *L. alpina* has been found by me at the following stations: Lima, no. 2666; Melrose, no. 2667, both in 1895. Most of the specimens named *L. alpina* in the herbaria belong to *L. spathulata* Rydberg.

DRABA DENSIFOLIA Nutt.; Torr. & Gray, Fl. N. Am. 1: 104. 1838.

*D. glacialis* var. *pectinata* Wats., Proc. Am. Acad. 23: 260.

It is very doubtful if this is a variety of *D. glacialis*. The more tufted habit, the more flattened, more hairy and few- (4–6) seeded pod may well give it the rank of a species. Under all circumstances the name *densifolia* is much older than Watson's name and should not be suppressed. Mr. Flodman's specimens from the Little Elk Mountains, Aug. 10, 1895, no. 499, are nearly identical with Nuttall's type in the Torrey herbarium. It was also collected by the author at Silver Bow in 1895, no. 2669.

DRABA OLIGOSPERMA Hook. Fl. Bor. Am. 1: 51. 1830.

This has been merged into *D. glacialis*, and yet has still more right to a specific rank. It has a very slender flowering and fruiting stem, much smaller leaves, and a pod that is not half the size and with only 2–4 seeds. It was collected growing with the preceding. Flodman, no. 488. Also collected by the author on a mountain near Lima in 1895, no. 2668.

THEROFON HEUCHERAEFORME.

*Saxifraga Jamesii* Hook. Fl. Bor. Am. 1: 47. 1833. Not Torr.

Caespitose with a thick scaly caudex, glandular-hirsute, 1–2 dm. high; basal leaves round-reniform, deeply and often doubly crenate, on petioles about ½ dm. long; raceme simple or somewhat compound; calyx campanulate or turbinate, tinged with purple; sepals ovate, erect; petals obovate-oblanceolate or oblong-

spatulate, dark violet, about equalling the sepals; stamens 10; styles free. (Plate 305, fig. 3.)

This has generally been confused with *T. Jamesii*, which it much resembles in habit. The main characters that distinguish the two are: in *T. heucheraeforme* the petals are dark bluish violet, scarcely exceeding the sepals and comparatively narrow, and the styles free (see plate 305, fig. 3); in *T. Jamesii* the petals are reddish purple, orbicular on a long claw, and often twice as long as the sepals, and the styles are united to near the top (see fig. 4). Both have 10 stamens, and differ in that respect as well as in habit from the other species of *Therofon*. In habit they much more resemble *Heuchera*. They may constitute a fairly good genus; but the arctic *T. Richardsonii* seems to connect them with the other species with 5 stamens, small white flowers and diffuse panicles.

*T. heucheraeforme* extends from the Black Hills of South Dakota to the Teton range of Wyoming and northward. The following specimens from Montana have been seen: Flodman, no. 514, July 28, 1896, from Bridger Mountains; P. A. Rydberg, no. 2677, July 23, 1895, from Bozeman Cañon; Frank Tweedy, no. 255, 1887, from East Boulder. *T. Jamesii* (Torr.) Wheelock, is as far as I know, confined to the alpine peaks of Colorado.

MITELLA VIOLACEA n. sp.

Stem from a perennial rootstock, slender, about 3 dm. high, leafless, finely puberulent and with a few long silky hairs. Basal leaves on petioles 5–10 cm. long, the blade and petiole sparingly hispid, broadly cordate in outline, slightly 5–7-lobed with rounded finely crenate lobes; raceme very short with small nearly sessile flowers; flowers about 2 mm. in diameter; sepals ovate, rather obtuse, very thin and petal-like, veined and tinged with violet; petals oblanceolate, entire or slightly 3-cleft, a little exceeding the sepals (Plate 305, figs. 1–2).

In the form of the flower this stands nearest to *M. diversifolia* Greene. The sepals and petals are of the same size and form, but the former are generally tinged with violet and the latter less deeply 3-toothed, or entire. The leaves are broader and rounder in outline, the lobes shallower and rounder and evidently crenate. In other words the leaves are almost identical with those of *M. pentandra* Hook., from which the plant is easily distinguished by the small, nearly sessile flowers and the form of the petals. With

*M. trifida*, which also has 3-cleft petals, it can scarcely be confused, as that species has reniform leaves, larger flowers, and the segments of the petals are filiform.

Type: J. H. Flodman, no. 527, Spanish Basin in the Madison Range, Montana, July, 11, 1896, altitude 6000 ft.

POTENTILLA CANDIDA Rydberg, Bull. Torr. Club, 24: 6. 1896.

A few specimens of this species were collected by me in 1895, at Deer Lodge, no. 2688, and at Lima, no. 2687.

POTENTILLA CONVALLARIA n. sp.

Stem tall, erect, 4–10 dm. high, long-villous but not very dyensel so, glandular or viscid, especially above, branched above with long erect branches. Stipules ovate or lanceolate, more or less toothed, about 1 cm. long; basal leaves several, with villous petioles 5–10 cm. long, pinnate of 4–5 pairs, glabrate or slightly pubescent; leaflets 2–5 cm. long, broadly obovate and obtuse, coarsely serrate and incised with ovate teeth; stem leaves with fewer more acutish leaflets; cyme with rather elongated upright branches, but with short pedicels, and therefore rather elongated and narrow; flowers 10–18 mm. in diameter; calyx densely glandular-viscid, villous, not much enlarged in fruit, 8–10 mm. in diameter; petals broadly obovate, white, in drying turning yellow, a little longer than the sepals; bractlets lanceolate, much smaller than the ovate-lanceolate sepals; stamens about 25, anthers flat, slightly cordate at the base. (Plate 306.)

This species resembles *P. arguta*, but is more slender. The branches of the cyme are rather elongated, the calyx smaller, the stamens fewer and the leaflets rounder and nearly glabrous. The leaves most resemble those of *P. glutinosa*, from which the plant differs mostly in its smaller and white petals and in the narrow cyme. It has been labelled *Potentilla arguta* whenever collected. It is apparently a rather rare plant, representing that species in the valleys of the northern Rockies. The following specimens have been examined:

*Montana:* Rydberg and J. H. Flodman, no. 602, in the Elk Mountains; no. 603 in the Spanish Basin; no. 604 (type) near Bozeman; no. 605 in the Bridger Mountains, all in 1896. F. L. Scribner, no. 42, 1883.

*Washington:* Wilkes Exp. no. 817; C. V. Piper, no. 1528.

*Assiniboia:* J. Macoun, no. 41, 1880. (?)

*Idaho:* A. A. & Gertrude Heller, no. 3230, 1896.

*Wyoming:* T. H. Burglehaus, 1894; E. Stevenson, no. 72, 1894.

*Alberta (?):* Macoun, no. 623, 1885 (Kananaskis).

POTENTILLA PSEUDORUPESTRIS n. sp.

(?) *Potentilla rupestris* Presl, Epim. Bot. 198. 1849. Not L.

*Potentilla glandulosa Nevadensis* Wats. Bot. Cal. 1: 178. In part. 1876. Not *P. Nevadensis* Boiss.

Stem erect, slender, striate, 2–5 dm. high, branched, with slender ascending branches, sparingly glandular-villous. Stipules ovate, more or less toothed. Basal leaves several on rather short petioles, pinnate with 3–4 pairs, sparingly and finely pubescent or glabrate; terminal leaflet obovate-cuneate-flabelliform, the lateral ones obliquely elliptical or nearly orbicular, all coarsely serrate and incised with ovate mucronulate teeth; stem leaves generally few, 2-paired or ternate with more rhomboid leaflets; cyme open, with ascending branches and slender pedicels; flowers 15–20 mm. in diameter; calyx more or less glandular-viscid, villous, in fruit not much enlarged, 8–10 mm. in diameter; petals white, drying yellowish, broadly obovate, exceeding the sepals by ⅓; bractlets oblong or lanceolate, much shorter than the ovate lanceolate pointed sepals; stamens about 25; anthers flat, a little cordate at the base. (Plate 307.)

This species is exceedingly similar to the European *P. rupestris*, from which it differs only in the smoother leaves and the longer pubescence of the stem. It differs from the other white-flowered American species in the open cyme, the slender pedicels and the larger petals, which nearly equal in size those of *fissa* and *glutinosa*. It grows in the mountains at an altitude of 2000 to 3000 m. The form growing at lower elevations is more leafy, with larger and glabrate leaflets and less viscid stem; this I took for *P. lactea* Greene, but Professor Greene has assured me that it is not that plant. In alpine regions it is more glandular viscid and with smaller leaflets. The following specimens have been examined:

*Montana:* Rydberg and J. H. Flodman, Long Baldy, Little Belt Mountains, no. 598 (type); Yogo Baldy, no. 499: Spanish Basin, nos. 597 and 600; Little Belt Mountains, no. 601 (altitudes, 6–8000 feet); R. S. Williams, no. 754, 1888.

*Idaho:* B. W. Evermann, no. 363, 1895; J. H. Sandberg, no. 164, 1888; J. B. Leiberg, 1890.

*California:* W. H. Brewer, no. 1714, 1863; Kellogg & Harford, no. 211, 1868–9.

*Washington:* W. H. Suksdorf, 1885.

*Yellowstone National Park:* T. H. Burglehaus, 1893.

*Rocky Mountains of British America:* Dawson, nos. 7471, 7870, 18734, 1430, 1881; J. Macoun, no. 10474, 1895.

SPIRAEA DENSIFLORA Nutt.; T. & G. Fl. N. Am. 1: 414. 1840. Under *S. betulaefolia.*

*S. chamaedrifolia* β Hook. & Arn. Bot. Beechy, 123. 1841. *S. betulaefolia rosea* in herb., not Gray.

This seems to be well distinct from *S. lucida*, which is common in the same region. The latter grows mostly in open places, while *S. densiflora* is found only in the deeper woods. Bridger Mountains, Flodman, no. 543, and Little Belt Mountains, no. 544. The following specimens also are in the Columbia Herbarium: Nuttall (type) Rocky Mountains of Columbia; Beechey's Voyage, Kotzebue's Sound; J. M. Macoun, British Columbia, 1890.

HEDYSARUM SULPHURESCENS.

*H. flavescens* Coulter & Fisher, Bot. Gaz. 18: 300. 1893. Not Regel & Schmalh.

This was collected by J. H. Flodman in 1896 in the Spanish Basin, no. 650, and in the Bridger Mountains, no. 651, and by the author in 1895 near Bozeman, no. 2720.

TRIFOLIUM HAYDENII Porter in Hayden's Surv. 1871: 480. 1871.

This was referred to *T. Kingii* by Watson, but has nothing to do with it. It is rather common in certain localities of central and southwestern Montana. Flodman, no. 623, from the Bridger Mountains, and no. 624, from the Spanish Peaks; Frank Tweedy, Park Co., Montana, 1887, and in the Yellowstone Nat. Park, 1884. Also collected by the author and T. A. Williams in the Spanish Basin.

VACCINIUM MICROPHYLLUM (Hook.)

*V. Myrtillus* var. *microphyllum* Hook. Fl. Bor. Am. 2: 33. 1834.

In my opinion this is just as good a species as any, differing from

*V. Myrtillus* in the bright green branches, the small leaves, which are more pointed and scarcely half the size of those of that species, in the smaller nearly sessile flowers and the small bright red berries, which become dark purple only when fully ripe, never bluish black as in *V. Myrtillus*. It is common in Montana and was collected by Flodman in the Spanish Basin, no. 712.

GENTIANA CALYCOSA MONTICOLA.

*G. calycosa stricta* Griseb. Gen. & Sp. Gent. 292. 1839. Not *G. stricta* Willd., nor Klotzsch.

This beautiful little gentian was collected on the top of Yogo Baldy in the Little Belt Mountains, Aug. 24, 1896, Flodman, no. 726.

POLEMONIUM VISCOSUM Nutt. Journ. Acad. Phil. (II.) 1: 154. 1847. Not Gray.

In describing *P. viscosum*, Gray* states that it has rounded calyx-lobes, and gives as reference: Pl. Gamb. 154 mainly, excluding what relates to the "elongated lanceolate segments of the calyx." The *Plantae Gambellii* were published in the Journal above cited. Nuttall describes there the calyx-segments as being elongated lanceolate, both in the Latin description and in the general notes written in English. In order to settle the matter I have written to the Curator of the Philadelphia Academy of Sciences, Mr. Stewardson Brown, who has kindly loaned me Nuttall's type. This is not a very good specimen, is past blooming, but it is satisfactory for my purpose. It shows that the inflorescence was subcapitate or subspicate and that the calyx-segments were elongated lanceolate. On the same sheet as Nuttall's type there is another specimen collected by T. S. Brandegee in the state of Washington; under the two specimens is penciled in the handwriting of the late Mr. Redfield the following remarks: "These all seem quite different from *P. confertum* in the flowers and mode of flowering. Yet I cannot fit them to Gray's description of what he regards as Nuttall's *P. viscosum*."

From the more complete material I have at hand, viz.: specimens collected by J. H. Flodman, no. 742, August 19, 1896, on

* Syn. Fl. 2: part 1, 150.

the top of Long Baldy, Little Belt Mountains, and by Frank Tweedy, 1887, in Park County, Montana, I can easily see that *P. viscosum* Nutt. is a near relative to *P. confertum* Gray. It has the same general habit and inflorescence. The corolla is, however, shorter, more open-funnelform and dark blue and the segments of the leaves are much smaller and rounder. The plant is very strong scented.

What Dr. Gray regarded as *P. viscosum*, I think I know, as there is a specimen in the Torrey herbarium, received from Dr. Gray and labelled in his handwriting. This specimen agrees also fully with Dr. Gray's description. It should be known under the name

POLEMONIUM PARVIFOLIUM Nutt. mss.

*P. Mexicanum* Nutt. Journ. Acad. Phil. 7: 41. 1834. Not Cerv.

*P. viscosum* Gray, Proc. Am. Acad. 7: 280. Not Nutt.

I have also examined Nuttall's type of *P. Mexicanum* collected by Wyeth, on the Flathead River. It differs from Gray's *P. viscosum* in no respect except that the calyx-lobes are a little longer. Nuttall himself has changed the name on the label to *parvifolium* probably because he had found that the name *P. Mexicanum* had been used before. That Gray had seen this specimen can be seen from a postal card from him, pasted on the same sheet, dated January 6, 1880, and on this, he states that he regarded it as being near *P. pumilum* var. *pulchellum*, and adds: "If I had to do it over, I would add a var. *parvifolium* to it." As *P. Mexicanum* and *P. parvifolium* are both based on the same specimens it is strange to find that Dr. Gray in 1886,* makes the following remark under *P. foliosissimum*. "To this probably belongs *P. Mexicanum* Nutt. Journ. Acad. Philad. 7: 41, from the northern Rocky Mountains." It is evident that the Nuttallian specimens of *P. Mexicanum* both in the Philadelphia and the Torrey herbaria belong to the same species as Gray's *P. viscosum*, which is a very near relative of *P. pulchellum*, at least as that species is understood in America, differing mainly in the smaller flowers. Flodman, Spanish Basin, nos. 739 and 740. 1896.

* Syn. Fl. 2: part 1, Suppl. 412.

## Notes on two Species of Alternaria.

By L. R. Jones and A. J. Grout.

(Plate 308.)

During the summer of 1896 we were engaged at the University of Vermont in the study of certain plant diseases, particularly the early blight of potatoes. The economic results of the work have been fully treated by Professor Jones in the Ninth Annual Report of the Vermont Agricultural Experiment Station of 1895, issued in December, 1896.

The present article aims to deal more fully with the taxonomic results of the work than was possible in the article cited above. Careful cultures, which were begun by Mr. C. C. Tracy the winter before, were carried on for several months and established beyond a doubt that two entirely distinct species of *Alternaria* were found on the cultivated potato; and a study of material from many different localities has also shown that these two species have not been distinguished by most students of the early blight, but have both passed under the name of *Macrosporium Solani* E. & M. Even Dr. Paul Sorauer (Zeitschrift für Pflanzen Krankheiten, 6: Heft I.,) failed to distinguish the two species, although he made cultures from diseased leaves bearing both fungi, as is clearly indicated by his figures and the fact that both species were raised from potato leaves sent Professor Jones by Dr. Sorauer.

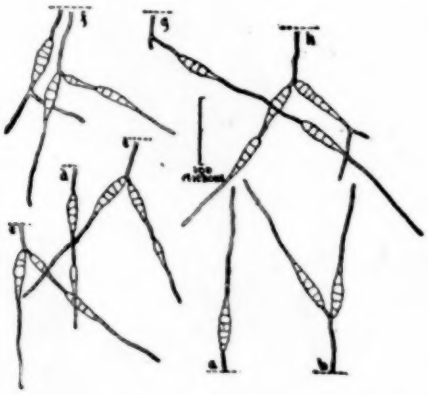
The significance of this separation of the two species lies in the fact that one of the species is an active parasite causing the destructive early blight of the potato, while the other is in no way parasitic but a saprophyte growing on most decaying vegetable matter of every sort, being easily compared in this respect to the omnipresent *Cladosporium herbarum*. The true *Macrosporium Solani* E. & M., is the parasitic species. It is very destructive to the leaves of the potato early in the season before *Phytophthora infestans* begins to affect them. It forms peculiar "target boards" markings on the leaves as shown in this figure.

In the central portions of these spots the characteristic spores may usually be found. We have seen whole fields with foliage so

riddled with these "target boards" that the growth of the crop was stopped and the plants practically killed, showing only a little green at the top of the stems. The parasitism of this species was fully proved by experiments which are described in detail in the report above mentioned.

To state the case in a word, healthy plants under normal out-of-door conditions were successfully inoculated with spores from a pure culture made in the University of Vermont Laboratory.

Usually he spores of this species are borne singly, but in one particularly luxuriant pure culture they were found in chains as is here shown. This places the species in the genus *Alternaria.*



The other species, which ought to be known by the name *Alternaria fasciculata,* for reasons given below, is found abundantly on the dead leaves of the potato, but all attempts at inoculation of living tissues failed to produce any infection, even under the most favorable green house conditions.

During the same summer studies of fungus diseases of the onion were undertaken and on some of the dead onion leaves a fungus was found which so closely resembled *Alternaria fasciculata* as to be indistinguishable from it. Spores of *Alternaria fasciculata* from a pure culture from potato leaves were sown on dead onion leaves still attached to a living plant. A rank growth of mycelium bearing the characteristic *Alternaria* spores soon appeared on the inoculated spots, but none elsewhere. This experiment thoroughly demonstrated the undiscriminating nature of the plant, for a fungus which will grow on dead leaves of onions and of potatoes can scarcely be restricted to any group or groups of plants.

When later on in the summer the study of the tomato rot was taken up, it was found that the fungus which causes the black patches on the rotting fruit was an *Alternaria* not distinguishable from the one on the onion and the potato. It was further proved that this fungus did not cause the rot, for green tomatoes inocu-

lated with spores from a pure culture from the tomato remained for ten days in a moist chamber until they ripened without showing signs of the rot, and cultures made from tomatoes just beginning to rot would not yield the *Alternaria*. *Alternaria fasciculata* was found on the dead leaves of beans, cabbage, *Lathyrus palustris*, on hulls of oats and dead stems of buckwheat; also on dead leaves of corn where it equals *Macrosporium maydis* E. & E., on pasteboard, equalling *M. chartarum* Pk., on ripe pods of radish, equalling *M. fasciculatum* E. & E.

Doubtless, further investigations will identify many other *Macrosporium* species with this omnipresent saprophyte, and doubtless an older name than the one given above will be given to it.

ALTERNARIA SOLANI (E. & M.) Sorauer, Zeit. Pfl. Krankh. 6: 6. 1896.

*Macrosporium Solani* E. & M. Am. Nat. 16: 1003. 1882.

Conidiophores dark brown, erect or ascending, somewhat curved, septate, 50–90 by 8–9$\mu$; conidia obclavate, brown, 145–370 by 16–18$\mu$, terminating in a very long hyaline septate beak, equalling fully ½ length of spore, body of spore with 5–10 transverse septa, longitudinal septa few or lacking.

Forming characteristic target-board markings on leaves of *Solanum tuberosum*; sporulating sparsely in pure cultures. (Pl. 308, figs. 1, 2, 3.)

ALTERNARIA FASCICULATA (C. & E.)

*Macrosporium chartarum* Pk. 25th N. Y. Report. 93. 1873. Not Preuss. 1848.

*Macrosporium fasciculatum* C. & E. Grevillea, 6: 6. *pl. 96.* 1877.

*Macrosporium Maydis* C. & E. l. c. 87.

*Macrosporium tomato* Cooke, Grevillea, 12: 32. 1883–84.

Conidiophores brown, erect or ascending, irregularly curved, solitary or caespitose, septate, diameter uniform, 40–130$\mu$ long by 3$\mu$ wide; conidia dark brown, oblong-ovate, minutely apiculate, 9–14$\mu$ wide by 35–90$\mu$ long, endochrome transversely 2–7-septate, with usually several longitudinal septa, the apical cell short or elongated into a straight somewhat hyaline beak.

Fruiting freely in pure cultures. On dead leaves and decaying vegetable matter of all kinds. (Pl. 308, figs. 4, 5, 6.)

The spores vary a great deal according to the stage of development, as seen in the figures, which accounts for the discrepencies in the descriptions.

There has been no opportunity of comparing this species with *Alternaria chartarum* Preuss; (Sacc. Syll. 4: 546,) consequently the above binomial has been used.

Careful comparisons have been made with Ellis & Everhart's Fungi Columb. 396, *Macrosporium chartarum* and 399, *M. fasciculatum*.

## Two new Bolivian Ferns of the Miguel Bang Collection.

By B. D. Gilbert.

There are about fifty species of ferns belonging to the Miguel Bang collection yet to be published. All of them, however, belong to well established and recognized species except the two described below. The only other genus of the collection containing especially desirable species is *Acrostichum*, which is particularly strong; and while the specimens do not always contain fruited fronds, they are of such a character that little doubt can be entertained in regard to the identity of the species.

The new species and variety are as follows:

### Blechnum nigro-squamatum n. sp.

Stipes 1 ft. long, stout, 1/4 in. diameter, furrowed, thickly clothed for 6 in. from base with narrow lanceolate acuminate black scales 1/2–3/4 in. long; rachis strong, stramineous, naked, deeply channeled on upper side, with a wing on each edge in upper 3/4 of frond connecting the pinnae; frond 4–4 1/2 ft. long, 1 ft. broad in center, fully pinnate in lower quarter, tapering rather abruptly upward and moderately downward; pinnae numerous, 6–7 in. long in middle of frond, 1/2–5/8 in. wide, dilated on both sides at base and slightly connected except in lower quarter; lower pinnae 2 in. apart, reduced to 2 in. long, but broader in comparison, blunt but not rounded at tip, mid-pinnae about same width throughout until within 1–1 1/2 in. from tip, where they decrease and become acute; edge finely serrate and wavy; texture coriaceous, both surfaces naked; costae stramineous, conspicuous; veins distinct, simple and occasionally forked; sori extending from near the base of costa on each side, to about 1 in. from tip

of pinna, sorus on upper side of costa shortest at the base; indusium broad, conspicuous, dark brown.

This species is intermediate between *B. nitidum* Presl. and *B. Finlaysonianum* Wall. It differs from *B. nitidum* by its much larger size, longer stipes thickly clothed with black scales, reduced lower pinnae and fully pinnate character. It resembles *B. nitidum* in general cutting of frond, in having undulato-dentate pinnae and a conspicuous indusium. It comes nearest *B. Finlaysonianum* in size, but differs in color and vestiture of stipes, narrower pinnae which are connected in upper part of frond, serrate edges and less reduced lower pinnae.

Growing in running water, Colapampa. Collected July 4, 1894 (2314).

DRYOPTERIS VILLOSA INAEQUALIS n. var.

Frond 1–1½ ft. long, tripinnatifid, pinnae on one side 6–10 in. long, 2–3¼ in. wide; on the other side 3–5 in. long, ¾–1¼ in. wide; stipes and rachis very scaly to within 6 in. of tip of frond; sori small, indusium inconspicuous.

This differs from the type by its much smaller size, by its very unequal pinnae on the two sides of the rachis, by having nearly the entire stipes and rachis scaly as well as pubescent, the sori few in number and smaller and the indusium much less prominent. Had there been but one frond of the *Dryopteris*, it might possibly have been looked upon as an abnormal form of *D. villosa;* but there were two separate fronds, both of them identical in character, and it seems quite certain that they may be regarded as a true variation from the original type. Uchimachi, Yungas, August 22, 1894. Growing in wet mould, forest-shade (2394).

## Three new Ferns from Jamaica.

BY B. D. GILBERT.

ASPLENIUM BIANTHEMUM n. sp.

Caudex very small, crowned with short ovate-lanceolate dull brown or almost black scales; stipes ½ to 1 in. long, scantily pubescent; rachis green-margined throughout, extending beyond the frond and proliferous at summit; frond 3 to 4 in. long, ½ to ¾ in. wide in middle of frond, pinnae gradually decreasing in size

each way but not so small at base as at tip of frond; pinnae 12 to 18 on side alternate stalked, rhomboidal in center, flabellate at tip of frond lower side cut straight at right angle to rachis, inner edge truncate, upper and outer edges slightly sinuate toothed; veins, two main ones, superior once forked, inferior with 4 to 5 branches, lowest branch parallel with inferior edge; sori 1 to 3, generally 2 at outer end of pinnae, lower one parallel with lower edge of pinna, upper one oblique, forming a V with the other, the broad end of V opening outward; indusium broad, whitish, distinct, opening toward center of pinna.

Between *A. projectum* and *A. viride*, larger than *A. projectum* but with same rooting rachis. Pinnae more rhomboidal than in *A. viride*, less toothed and with fewer sori, which are at outer end of pinnae instead of inner end.

Blue Mt. Peak, Jamaica, growing on trees. Collected by Alexander Moore.

### Dryopteris contermina bisymmetros n. v.

Stipes about 6 in. long with a few scales at base, rather stout, dirty brown, finely pubescent, rachis similar; frond 10–15 in. long, 3–6 in. broad, lanceolate, tapering from middle to both extremities, pinnate; end of frond long and narrow, pinnato-entire, rigidly chartaceous; upper surface nearly naked, rachis costae and costulae on under side densely villose; pinnae narrow, lanceolate, spreading, numerous, sessile, alternate to tip of frond, pinnatifid nearly to midrib, segments blunt, hardly subfalcate, lowest segments on superior edge diminished in size, middle pinnae 2 in. long, lower pinnae ¾–1 in. long with some auricles on stipe below, rather remote, several of lowest pairs same shape as frond tapering to each end, small upper pinnae entire, connected by narrow wing; veins all free and simple, 6–8 on a side; sori near the edge naked or indusium early evanescent.

Fern Gully, Jamaica, collected by myself.

This variety differs from *D. contermina* proper by its more rigid texture, its stronger and darker colored stipes and rachis, and especially by the shape of the pinnae which are spindle-shaped instead of having the basal segments enlarged as in *D. contermina*. Both the frond and the segments are spindle-shaped, which was the reason for giving it the varietal name of *bisymmetros*.

### Polypodium leucolepis n. sp.

Caudex rather stout, ascending, covered at summit with lanceolate acuminate dark brown ciliate scales; stipes of young

fronds covered with soft brown hairs, which fall away with age except at very base, reddish brown, 2½–5 in. long; mature frond 7–11 in. long, 2–3 in. wide, pinnate, tapering abruptly at base to auricles, but gradually to tip of frond, sometimes 5 in. of upper end of frond being about ⅝ in. wide throughout, while sometimes the shape is very regular, tapering to a blunt point and almost pinnate to the end; pinnae opposite or alternate, nearly linear, blunt, notched on lower side at base, slightly auricled on upper side, irregular in length but presenting a generally uniform character; surfaces naked, rachis only pubescent; costae and veins very distinct beneath, blackish purple; veins all simple, terminating short of the edge, each bearing at the end a round sorus with edge of frond showing beyond it; edges and ends of pinnae ciliate with scattered hairs of the same color as veins, which fall away with age; receptacles punctured through to upper side of pinnae, each one bearing a white button, after the fern reaches a certain age; texture coriaceous, veins not showing on upper side.

Nearest to *P. Plumula* but differs in texture, in larger size, in broader pinnae, in more distinct venation and in the white buttons on upper side of frond.

Blue Mountains, Jamaica, collected by Alexander Moore.

## Botanical Notes.

*The Vermont Botanical Club* held an extremely interesting session at its second annual meeting on February 5th and 6th 1897.

The meetings were held in one of the lecture rooms in the new Williams Science Hall. Papers were read in person by President Ezra Brainerd and Profs. E. A. Burt and H. M. Seeley, of Middlebury College; Profs. L. P. Jones, G. H. Perkins and F. A. Waugh, of the University of Vermont; Mr. C. G. Pringle, of Charlotte, Vermont, and several others.

Mr. Pringle's paper, which will be printed in full in another issue of the BULLETIN, was probably the most highly appreciated of all. We have all known of Mr. Pringle's great achievements as a collector and explorer, but I think very few realize what a delightful speaker and writer he is when induced to lay aside his habitual timidity and reserve.

The importance of a botanical survey of the State was

urged upon all interested in Vermont botany by Prof. Jones, Prof. Burt and others, and it was decided to publish in '98 or '99 a new State Flora which shall embody the large amount of information collected by members of the club and others since the publication of Prof. Perkins' Flora in 1888. It is intended that the list shall contain not only a list of Phanerogams and Pteridophytes, but also of the Musci and possibly of the Hepaticae and Fungi.

The meetings of the club were attended not only by members but by many others, the attendance varying from fifty to one hundred. The air was fairly electric with botanical enthusiasm, affecting even the reporters present.

It has been the aim of the club to arouse a general interest in botany and foster enthusiasm by bringing together all persons in the State who are at all interested in the study of plants. Its marked success in this direction is due very largely to the efforts of President Brainerd and Prof. Jones, both of whom have been indefatigable in the work of interesting others in our varied and interesting flora.

The success of this club ought to encourage the organization of similar associations elsewhere. The first meeting was held on July 4, 1895, in the heart of the Green Mountains in Stratton, where half a dozen enthusiasts had gathered to celebrate by collecting rare carices. A temporary organization was formed with President Brainerd as president and Prof. Jones as secretary, and a committee was appointed to arrange for the first in-door meeting in February, '96. That meeting was successful beyond all anticipations, as was the field meeting and excursion to Mt. Mansfield in July, '96.

An excursion to Mt. Willoughby or some other point of botanical interest is planned for the summer.

A. J. GROUT.

*Note on Dicksonia dissecta* Sw. Considerable discrepancy exists among authors concerning the synonymy of species in the genus *Dicksonia*. Swartz, who was the original author of *D. dissecta*, as well as of its congeners *D. cicutaria* and *D. apiifolia*, describes it as "very decompound, pinnules oblong, obtuse, sinuato-pinnatifid, laciniae obtuse *gibbous* subcrenulate." Hooker, in the "Species Filicum," described *D. dissecta* Sw. as a fern "which might with-

out violence to nature be considered a variety of *D. cicutaria.*" Judging from his description this is true, for it reads as if it might have been drawn from a frond of that species. Grisebach, however, while still retaining Swartz as the author of the species, gave it as "non Hook," thus showing that he did not agree with Hooker's description. Then came the "Synopsis Filicum," which gave *D. dissecta* as a synonym of *D. adiantoides* H.B.K., a bipinnate fern, and also gave it as "Grisebach, non Hooker," thus agreeing with Grisebach who gave "*D. adiantoides* W. non Hook," as a synonym for *D. dissecta.* This still further complicated the matter. The latest author to treat of the subject is Mr. G. S. Jenman in his "Ferns of Jamaica," 1891. He makes *D. adiantoides* H.B.K. the same as *D. Pavoni* in Hooker's "Species," and places it next to *D. Plumieri* HK. which has sori extending all around the edge of frond. His *D. dissecta* is placed next after *D. cicutaria* and *D. apiifolia,* thus making it accord with them in a general way, as it undoubtedly does.

The synonymy of *D. dissecta* is therefore decidedly mixed; but I accept Mr. Jenman as my guide, not only because he has been the latest to investigate the subject, and has enjoyed the privileges of the Kew herbarium and library, but also because he was for years an active collector in the field, an extremely careful observer, and had unrivalled opportunities for the comparison of living plants in their native habitats. Besides, his descriptions are taken from Jamaica specimens, and it was from this island that Swartz obtained his specimens from which the species was originally described. The only important point which Jenman's description omits is the fact that the sori of *D. dissecta* are not "in a crenature near the base," but on the summit of a tooth near the base, the whole width of which they cover, being about twice as broad as they are deep. Perhaps the "gibbous" feature of Swartz's description may refer to this hump near the base of the crenature.

The fact is that while the cutting of the frond quite closely resembles that of *D. cicutaria,* the situation of the sorus and the character of the sorus itself are distinctly different from that species. The sorus is twice as broad as long, the involucre proper is scariose, and the edge of frond is not changed in texture and hardly ever

reflexed. As the sporangia mature they simply push down the involucre, and almost, if not quite, cover and conceal it, but the edge of frond remains unchanged. In other words the involucre is distinctly two-valved, instead of being united with the edge of frond and therefore cup-shaped or campanulate; and I should be inclined to place it in the broad, two-lipped *Balantium* group, instead of the cup-shaped *Patania* group where *D. cicutaria* belongs.

*Fertilization of Alnus incana and Salix discolor.*—(1) *Alnus incana* (L.) Willd. Anemophilous; self-fertilization is prevented by the amentiferous branches curving downward at the end, bringing the pistillate aments above the pendulous staminate. Usually monoecious, but the number and condition of the two kinds of aments varies greatly upon different plants. Many of the bushes have the staminate aments large and fully developed, a part of the branches bearing no other kind, the number of staminate ones to a branch then increases from 3 or 4 to 6, 8 or 9. On the other hand, a part of the bushes have the staminate aments small and poorly developed, many branches bearing only the pistillate kind, which are then more numerous than when the branch is monoecious. It is not rare for a large bush to produce only pistillate aments, which are then larger in size (about 1″ longer) and a deeper brownish red. Young plants generally produce only staminate aments (from 4 to 7 branches are amentiferous) but this is never true of medium or large-sized bushes. The staminate aments are frequently injured by insect larvae. A branch two feet in length bore 297 aments of both kinds. The pistillate are much more numerous than the staminate; of 663 aments examined on several branches of a single plant 471 were pistillate, 192 staminate. A staminate ament 2½′ long was composed of 31 scales, 77 flowers and 310 stamens. The parts of the flower are usually in fours, petals none, but occasionally a flower is five-parted, when five petal-like scales alternating with the sepals may be present. The pollen is abundant and easily set free by the wind.

Visitor: During eight years I have never, except in one instance, seen this species of *Alnus* visited by insects. On April 6, 1892, on a sunny hillside I observed a score or more of the honey-bee, *Apis mellifica* ☿, collecting pollen. Examination showed that the "pollen-baskets" were loaded with pollen.

(2) *Salix discolor* Muhl. Entomophilous, but probably descended from anemophilous ancestors. Dioecious, blooming in early spring before the appearance of the leaves, when the bright yellow anthers render the staminate plants very conspicuous, odor marked and agreeable, honey and pollen abundant. A staminate ament about 1′ long contained 270 flowers. The pollen is not easily dislodged when a branch is shaken, and it is often retained by the silky hairs with which the ament is clothed after it has fallen from the anthers.

In a pistillate ament 1′ 1″ long there were 142 pistils, stigmas two, bilobed, nearly sessile, honey-yellow, papillose; the honey is secreted on the tip of a small flat gland at the base of the ovary on the inner side.

Owing to the pollen, of which there is a large store, the staminate aments attract a more numerous company of insects than the pistillate. Both bees and diptera are very common. Numerous black ants climb the stems and steal the honey, I have alao seen them struggling over and carrying off living *Rhamphomyia*.

According to H. Muller (Fertilization, p. 524) many species of *Andrena* visit the willows almost exclusively in search of food for their young.

Visitors: A. Hymenoptera—(1) *Apis mellifica* ☿, (2) *Andrena* sp. (3) *Halictus parallelus* ☿, (4) *Nomada bisignata;* B. Diptera—(5) *Myops vicaria*, (6) *Pristiphora idiota*, (7) *Borlorus* sp. (8) *Gonia frontosa*, (9) *Lucillia cornicina*, (10) *Homalomyia scalaris*, (11), (12), (13) *Rhamphomyia* three species; C. Coleoptera—(14) *Cyphon obscurus*, (15) *Dorytomus* sp. D. Hemiptera, one species. (Taken on aments of both kinds, April 20–24, Waldoboro, Me.)

NOTE.—In the identification of insects I am indebted to Dr. Henry Skinner, of Philadelphia.

JOHN H. LOVELL.

WALDOBORO, MAINE.

## Reviews.

*Catalogue of the African Plants collected by Dr. Friedrich Welwitsch in 1853–61.* Dicotyledons, Part I. By William Philip Hiern, M.A., F.L.S. Pp. 336. 8vo. London. Printed by order of the Trustees of the British Museum, 1896.

The volume under discussion is the first of a series and contains Ranunculaceae to Rhizophoraceae. Many new species are described and the very copious notes in reference thereto add materially to the value of the work and bear testimony to the indefatigable ardor and ability of the collector, who had all the usual concomitants of African travel to struggle against, as well as to the patience and skill of the compiler. Dr. Welwitsch's African collections have been estimated at upward of 5,000 botanical species and some 3,000 species of insects and other animals, a large proportion of which were new to science. A second part will finish the Dicotyledones and a third one will be devoted to the remaining groups. In the nomenclature line there is much of interest, and among generic changes the following should be noted: *Chienfugosia* Cav. (1786) replaces *Fugosia* Juss.; *Cracca* L. (1753), *Tephrosia* Pers. (1807); *Meibomia* Heister (1732) ex Fabric. (1759), *Desmodium* DC. (1813); *Canavali* Adans. (1763), *Canavalia* DC. (1825); *Doticholus* Medik. (1787), *Rhynchosia* Lour. (1790); *Amerimnon* P. Br. (1756), *Dalbergia* L. f. (1781); *Deguelia* Aubl. (1775), *Derris* Lour. (1790).

A. M. V.

*Nature, Structure and Phylogeny of Daemonelix.* E. H. Barbour. Bull. Geol. Soc. Am. **8**: 305–314. *pls. 31–39.* Ap., 1897.

In this contribution we have the author's final conclusions in regard to this exceedingly interesting organism—conclusions which are amply defended by an array of facts which skeptics will find it difficult to controvert.

What appears like phylogeny is represented by the vertical arrangement of the organisms in well-defined zones, beginning with simple fibres and evolving upwards through "cakes" and "balls" of matted fibres into "fingers" and finally into the gigantic coiled stems at the summit—a vertical range all told of some 75 meters.

The structure, as demonstrated by the microscope, is undoubtedly vegetable and the author finally says: "The study of the great tubes of *Daemonelix*, made possible by the recent discovery of perfectly preserved specimens, threatens to make radical, if not revolutionary change—removing *Daemonelix* altogether from the dominion of the algae and exalting it to that of the dicotyledons."

A. H.

*Stratigraphy and Paleontology of the Laramie and related Formations in Wyoming.* By T. W. Stanton and F. H. Knowlton. Bull. Geol. Soc. Am. **8**: 127–156. F. 1897.

How the Laramie formation should be limited and defined has been a burning question with geologists for more than a quarter of a century. Numerous local sub-divisions have been included or withdrawn, and the limits expounded or contracted by one authority or another, and its position in the geological column has been shifted back and forth between the Cretaceous and Tertiary periods.

The authors have wisely avoided depending upon one class of evidence only in drawing their conclusions and have drawn freely from both invertebrate palaeontology and palaeobotany, in trying to determine the relative ages of the several beds and the limits of what should be called the Laramie formation. Apparently the formation is defined by the authors as lying between the highest marine Cretaceous beds of the Rocky Mountain region at the base and including the lowest of the Fort Union plant beds as the summit.

A. H.

*The American Fruit Culturist.* By John J. Thomas. 20th edition, revised and enlarged, by Wm. H. S. Wood.

A timely book, sure to receive a hearty welcome. First written about thirty years ago, editions have quickly succeeded one another until the twentieth, now under consideration. It is a handy volume of less than 800 pages, presenting in a condensed, but always clear and practical form, a survey of the whole field of fruit culture, from the pineapple, banana and orange of semi-tropical Florida, to the many common small fruits of northern gardens. The only two omissions noticed are the almond and olive which have, perhaps, as good a claim to recognition as the

fig and date. All varieties which have approved themselves to the experimenters of later years, and become standard, are carefully described, while many others of lesser importance are relegated to a convenient descriptive index. The editor has sought the aid of experts in their several specialties and made diligent use of the copious literature from the State Experiment Stations, so that every subject is fully up to date. An admirable feature of the work is its wealth of illustration, all cuts of fruit being from nature and life-size. An interesting, but too short chapter is that on "Wild Fruits," including Buffalo berry, Huckleberries, June berry and Papaw (*Asimina triloba*). Under this head, but in a larger book, the reviewer might also expect to see several species of barberry, choke-cherry, yucca, cereus, opuntia, etc.

This work aims chiefly at the imparting of "practical directions for the propagation and culture of all fruits adapted to the United States," and in so far is certainly very successful. The botanical part, that is the scientific naming and classification of species and varieties, was apparently considered of little relevancy and importance, and neglected accordingly. Yet I cannot help thinking that in a standard work of this kind proper efforts at a scientific arrangement of the many kinds of fruits described, referring them, so far as known, to their parent species, varieties and races, would give it a distinct additional value. Under blackberry, currant, grape, etc., the generic, still less the specific names are not even mentioned, the various kinds being arrranged mostly according to color. Raspberry, plum and strawberry fare much better, being naturally classified. The improved cultivated forms of hickories are referred to the "shellbark (*Hicoria laciniosa*)" instead of the shagbark (*H. ovata*). Valuable fruit trees seemingly are the black walnut and butternut "whose nuts are highly appreciated and much used;" the better and more promising fruit of the California walnut is not mentioned.

Despite these little imperfections, showing the lack of a botanist's touch, this book remains our best manual of fruit culture, and the most useful guide and counsellor for all fruit growers.

V. H.

*Plants and their Children.* By Mrs. William Starr Dana. Illustrated by Alice Josephine Smith. Pp. 272. American Book Company, 1896.

The author presents in a popular form the study of plant life so as to bring it within the comprehension and adapt it to the tastes of a child.

An appreciation of the psychologic truth, "activity is the law of childhood" is shown by the attention accorded to the special contrivances and mechanisms by which insects are trapped and attracted, and seeds disseminated. Vital processes, similar to those in the child's experience such as sleep, respiration and circulation are simply and clearly treated. Several cuts, reproduced from the Natural History of Plants, translated from the German of Kerner von Marilaun, add to the general attractiveness of the book, which might profitably be used at times as a reader to supplement the work of a class studying botany.

M. A. S.

## Proceedings of the Club.

WEDNESDAY EVENING, March 31, 1897.

In the absence of the President, Vice-President Allen presided. There were twenty persons present.

The first paper, by Dr. Albert Schneider, "The Phenomena of Symbiosis," and a paper by Leonard Baron on "Horticulture in Botanical Gardens," were read by title, owing to unavoidable detentions.

The evening was occupied by a paper by Professor Edward S. Burgess on "*Aster macrophyllus* and its Allies," illustrated by charts of relationship and by numerous specimens.

The speaker sketched briefly the history of the species *Aster macrophyllus*, in which it has been the custom of American botanists to include all large-leaved *Asters*. He showed how diverse these *Asters* are and in what confusion their assignment to a single species results, and indicated the characters according to which they form two groups each of several species and varieties.

The paper which will soon appear in print, was discussed by

Mr. E. P. Bicknell, who confirmed the distinctions offered by the results of his observations about New York, and by Dr. Britton, who paid a tribute to the masterly manner in which Dr. Gray had treated the subject of the genus *Aster* so far as material was then available and who referred to the special need for extended field-work and further collaboration which this genus had long presented.

TUESDAY EVENING, April 13, 1897.

In the absence of the officers, Dr. N. L. Britton presided. There were thirteen persons present. Mr. Ellis A. Apgar and Mr. Charles H. Coffin were elected active members.

In pursuance of a resolution adopted at the next previous meeting, the Secretary announced the following Field Committee for 1897: Chairman, Dr. John K. Small; Committee-members, Dr. N. L. Britton, Mr. John H. Stotler, Mr. L. G. Fay, Mr. W. A. Bastedo.

The subject of a nominee from the Club for the forthcoming award from the Newberry Research Fund was then considered, and the application of Mr. Arthur Hollick for that nomination was read. Action was deferred to the next meeting.

The scientific program was then taken up. Dr. Albert Schneider presented a paper entitled, "Methods employed in the Examination of Powdered Drugs and their Adulterants."

He described certain microscopic structural features which he had investigated with a view to find characters by which to distinguish the more important drugs, giving details of such characteristics determined by him for mace, senna, leaves of *Eucalyptus globulus*, etc.

Dr. Britton spoke of the utility of this work and its object in behalf of the new edition of the U. S. Pharmacopoeia.

The paper was followed by an early adjournment to facilitate the attendance of members upon the annual exhibit given by the N. Y. Microscopical Society.

WEDNESDAY EVENING, April 28, 1897.

In the absence of officers, Prof. Underwood was elected chairman of the meeting and Prof. Britton, secretary. There were twenty-six persons present.

The application of Mr. Arthur Hollick for recommendation to the Council of the Scientific Alliance for the grant of $50 for original research in palaeontology from the Newberry Research Fund, was endorsed and the secretary of the club was instructed to certify this action to the secretary of the Council of the Scientific Alliance, and to transmit with the certification a copy of Mr. Hollick's application.

Dr. Small, Chairman of the Field Committee, reported progress in the arrangement of excursions for the season.

The Chairman announced to the Club the recent death of Dr. Emily L. Gregory, Professor in Botany in Barnard College, and remarked on her life and works. Dr. H. M. Richards, Dr. H. H. Rusby and Miss Alexandrina Taylor were appointed a committee to draw suitable resolutions and report them to the club at a subsequent meeting.

The Corresponding Secretary reported that all the corresponding members recently elected had accepted their elections.

The scientific programme comprised the following papers:—

1. By Prof. L. M. Underwood, "Notes on the Ferns of Japan."

The immediate occasion of this paper was the receipt during the past year of two separate collections of Japanese ferns of about fifty species each, which, being from different portions of the island, scarcely duplicated each other. Some of the more interesting were shown, including *Camptosorus Sibiricus*, *Cystopteris Japonica*, and *Struthiopteris orientalis*.

The insular position of Japan together with a considerable range of latitude, equalling that from St. Paul, Minn., to Mobile, Ala., gives Japan a larger proportion of ferns than we have in the United States, although the area of the islands is only that of the northeastern States as far as the Virginias, together with about one-half of Ohio.

The forms are those of temperate climates and agree well with those of the adjacent mainland so far as the latter are known. A few subtropical forms enter the flora, but the really tropical species do not reach the islands.

Many species are common inhabitants of Europe as well as the eastern United States, but the ferns of Japan offer very little support to the once prevalent notion of the great similarity of its flora to

that of the eastern United States. In fact about as many Japanese species have as many near allies in Pacific America as in other portions of the country, if we exclude the species quite generally distributed through the north temperate zone.

Discussing the paper, Prof. Britton cited a number of instances among spermatophytes, in which species supposed to be common to Japan and eastern North America had been shown to be distinct. He maintained that the theory of migration, as ordinarily accepted, was insufficient to account for such similarity between the floras of the two regions as actually exists. Mr. T. H. Kearney, Jr., remarked that in comparing the grass flora of the two regions he had found that, exclusive of circumboreal species, only two species are in common.

The second paper was by P. A. Rydberg, entitled "Floral Features of Western Nebraska." It is a popular misconception that the country from Illinois to the Rocky Mountains constitutes one undifferentiated region. In fact there are two entirely different regions, viz.: 1. The Prairie Region with rich loam and a comparatively good supply of rain and extending into the Eastern Dakotas, Nebraska and Kansas. 2. The Region of the Great Plains, with dry hard soil and scanty rainfall and comprising the western portion of said States, Eastern Colorado and Montana and the larger portion of Wyoming. In Nebraska the prairie region includes the eastern and south central portion of the State. The north central portion constitutes a region unique to Nebraska, the Sand-Hill Region, described at one of the February meetings of the Club. Mr. Rydberg corrected a statement made by him then, viz.: that he had seen "blow outs" in that region 300 feet deep; he had intended to say 300 feet in diameter and 60 to 70 feet deep.

The western portion of the State is made up of high plains, except a small portion of the northwestern corner containing the "Pine Ridge" and the "Bad Lands" of White River and Hat Creek. The plains have very few rivers, and the drainage is mostly by means of "sand-draws." Seen from a hill a sand-draw resembles a well-beaten and winding sandy road. It is a stream with no visible water. The water is running from one to fifteen feet below the surface. Even the larger streams, as the Lodge Pole and South Platte, sometimes sink down in the sand.

The plains are mostly covered by short grasses, the so-called Buffalo grasses. In the hot dry autumn, these become self-cured, and form an excellent winter pasture for the stock. A little hay is cut on the lowlands and fed to the animals during snowstorms. Otherwise the cattle and horses feed out during the whole winter. The Buffalo grasses are: the original Buffalo grass, *Bulbilis dactyloides*, Blue and Black Grama, *Bouteloua oligostachya* and *B. hirsuta* and "Nigger Heads," *Carex filifolia.*

In a region where the rainfall is comparatively scant and distributed only during certain seasons of the year, the plants must be so constituted as to be able to withstand a good deal of drought. In other words the evaporation must either be reduced to a minimum or the plant must have special stores of water. The planst peculiar to this region may be divided into the following groups:

1. Very hairy plants generally covered by thick pannose pubescence, which retain the moisture; as species of *Eriogonum*, *Astragalus*, *Eurotia*, *Senecio*, *Evolvulus* and *Artemisia.*

2. Plants with glaucous foliage having a hard epidermis, as *Yucca glauca*, *Rumex venosus*, *Argemone alba*, and several grasses.

3. Plants with white often shreddy bark, as species of *Mentzelia* and *Anogra.*

4. Plants with very narrow and often involute leaves, as *Lygodesmia juncea*, *L. rostrata* and several grasses and sedges.

5. Plants with fleshy stems in which the surface is reduced to a minimum and no leaves as the Cacti.

6. Plants with a deep-seated, enlarged root as the Bush Morning glory, *Ipomoea leptophylla*, and the Wild Pumpkin, *Cucurbita foetidissima.* Mr. Rydberg had seen a root of the former three feet long and almost two feet in diameter.

7. Plants covered with glands, containing essential oils, as *Dysodia papposa* and *Pectis angustifolia.* The oils are supposed by some to have a cooling effect, partly by taking up heat when evaporated, and partly by surrounding the plant with a cooler atmosphere, their specific heat being much less than the air.

Numerous specimens were exhibited.

Two papers followed by Dr. J. K. Small, (a) "The Sessile-flowered *Trillia* of the Southern states." (b) "Notes on Epilobiaceae." Both papers are published in the April issue of the BULLETIN.

Dr. Britton exhibited a specimen of *Silene conica* L., collected by Mr. A. D. Selby, at Clyde, Ohio. This species is a recent immigrant from Europe.

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